Chemical Age

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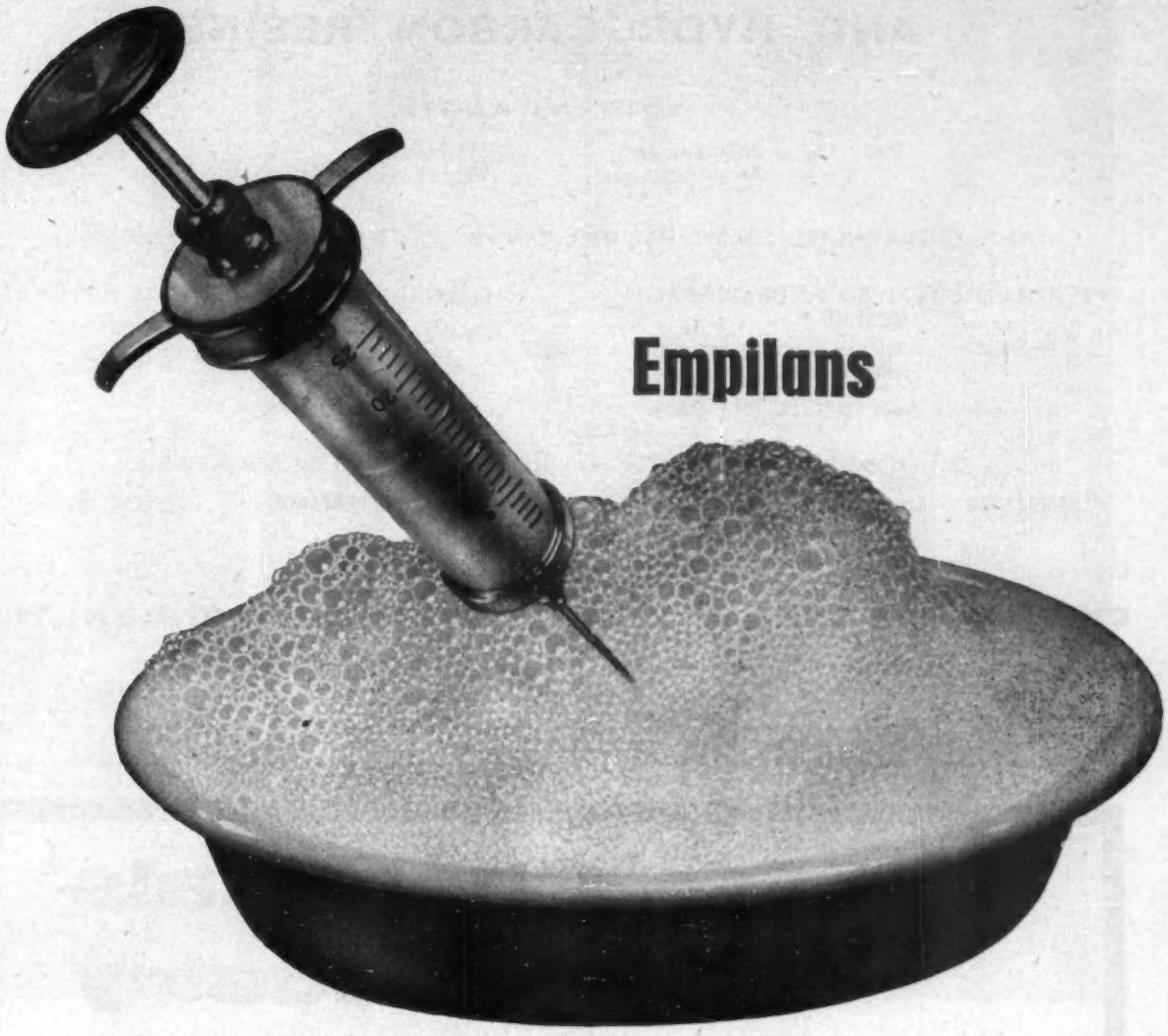

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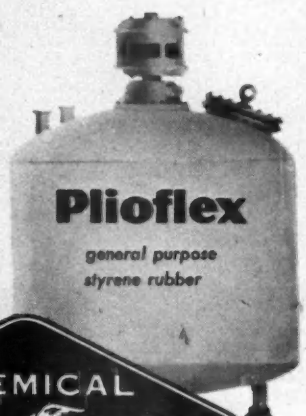

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INDIA'S CRISIS

WITHIN the last few days it has been announced that the last three months' policy in India of no open general licence is to be maintained for at least the next six months. It will be recalled that when the suspension of all import licences was made known, the Minister of Commerce in Delhi stated that the situation would be reviewed again in the half-yearly licensing period which began on 1 October.

From details issued in Delhi a few days ago, it is seen that drastic cuts have had to be made on many items, having regard to the insistent need to effect the maximum possible economy in the country's imports. These restrictions reflect the persistence of India's foreign exchange crises.

Import of over 100 consumer items continues to be completely banned. Scheduled industries, however, will be allowed licences for raw materials, components and spares. Provision has been made for the grant of actual user licences for items such as rock phosphate, wood pulp and copra. Another provision would grant actual user licences to small-scale industries for the import of essential raw materials and machinery and components. Provision has also been made for the grant of quota licences to established importers for raw materials of certain ancillary products required by indigenous industry. In cases of certain items which present difficulties in regard to procurement and shipment, provision has been made to grant licences on a basis of 12 months' requirements.

Quotas for machinery spares will be granted, and where import of certain machinery has not been permitted, licences may be granted to established importers for import of spares. Licences may also be issued to actual users for emergency spares to forestall any breakdown in industries.

There is no doubt that India's adverse balance of trade (the trade gap is now some £219 million), and diminishing foreign currency holdings largely result from demands made on the economy by the second Five-Year Plan which came into being in April, 1956. The success of the first Five-Year Plan was noted in the economic advances which resulted from it. There was the rise of 25 per cent in the production of the organised industrial sector. This, together with the increase in agricultural production by the greater use of fertilisers, is said to have produced an 18 per cent increase in real national economy. There was, therefore, a generally better and stabler economic and financial situation during the latter half of the first Five-Year Plan.

Causes for the development of the strain in India's economy and finance today are, of course, mainly due to the increased industrial effort that India has undertaken in the second plan period and the fact that her previous investment both in agricultural and industrial development has not yet resulted in sufficiently increased production. The heavy imports that have thus occurred in both public and private sectors have greatly depleted India's foreign exchange reserve. It is obvious that this situation will continue until the plants and machineries are erected.

With the change in 1956 and the balance of payments deficit for 1957 running at an annual £220 million, the Indian Government has attempted to meet the growing deficit by a series of restrictions on consumer and luxury imports while attempting to boost exports. It was during the latter

half of 1956 that certain chemical imports were restricted.

The import quotas imposed for the half year ended June, 1957, were estimated to save Rs 300 million (£17.5 million). But the effect of these restrictions and of those announced a few days ago will not be noted for some time. India's foreign currency holdings must therefore continue to decline. Whereas, for instance, India's sterling balances were about £500 million in January, 1956, they are now somewhere in the region of £280 million.

India's exports have for 1957 been running at an estimated £487 million, or 7 per cent above 1956; this increase has still not been great enough to counteract the increased imports. Indeed, the Indian Minister of Commerce recently suggested that India's exports would have to increase by about 25 per cent over the next two or three years, but an increase of this size is considered most unlikely.

The Indian Finance Minister now speaks of implementing the 'core' of the plan. The Government had relied on deficit financing and foreign loans and aids to bridge the gulf between requirements of the plan and internal resources of the country. However, with regard to foreign loans and aid, the Indian Government's expectations have been belied.

When Mr. Nehru came to London for the Commonwealth Ministers' Conference, he appealed unsuccessfully for a £200 million loan.

The possibility that India would go to Wall Street to raise money is borne out by the visit of India's Finance Minister to the US and Europe. To date, India has obtained loans associated with specific projects, mainly from the World Bank, but these loans are very small compared with the country's trade deficit and needs. There are now indications, however, that the visit to the US of India's Finance Minister has borne fruit and the US Ambassador to India has stated recently there were good prospects of India receiving additional US financial aid. Moreover, a purchasing mission is to be sent shortly to the US and other countries to buy equipment.

Enlightened Indians feel that India should not take fright or move for curtailment of the second Five-Year Plan. The country realises that it must have a firm industrial base, which was largely neglected in the first Five-Year Plan. India needs heavy industries as a basis both for her prosperity and defence, and such industries are now being developed. But alongside this growth there appears to be concern at waste in industrial production, as for example, accumulation of blast furnace slag which could annually give over half a million tons of cement, which is sorely needed in construction.

Regarding imports, there has also been the complaint from Indians that unlimited imports of all kinds of consumable goods, including cosmetics and trinkets, have been allowed, so that now even the import of scientific instruments and scientific books has to be drastically restricted. Such imports are, of course, essential as ancillaries to development.

It is to be hoped that India will be able to achieve some suitable balance in her economic position. In the meantime, this country should endeavour, despite its own problems, to assist India, for as can be seen, if it does not, the US will, so that a situation such as has developed with the US and Canada will result.

A NEW INDUSTRIAL MATERIAL

THIS LAST week has seen a revolution in materials development—the production of plastic-coated steel. This new material of steel sheet bonded to polyvinyl plastic and given the trade name Stelvetite, has been marketed in the UK by John Summers and Sons, one of Britain's major steel producers.

The company states that Stelvetite can be bent, formed, seamed, deepdrawn, joined and welded without damaging the coating. The p.v.c. coating can be in any colour and with a range of embossings. On the reverse side the sheet is of either bonderised steel or electro-zinc coated. The sheet is also said to be resistant to acids, oils, weather and abrasion and can be cleaned with detergents.

A main advantage of Stelvetite is that it combines the strength of steel with the flexibility, corrosion resistance and surface finish of plastics. The coating of plastic is 14-thousandths of an inch thick—some four to five times thicker than a normal coat of paint. Also, as the plastics material is laid on in the form of sheet instead of in the form of a liquid applied by brush, the thicker coating formed will be a better safeguard against corrosion. The coating can also be embossed or indented or formed as desired. Being of p.v.c., too, it is virtually scratch proof.

Another advantage of this new material which has resulted from two and a half years' work by John Summers in collaboration with BX Plastics, is that it has, unlike US products, a better adhesion between the plastic and steel. In the process developed, the steel is coated continuously from coil with a special p.v.c. formulation. Secret of the good adhesion is the adhesive used and the temperature at which it is cured or solidified to form the finest fixature glue. In fact, control of this temperature is understood to be the critical point of the whole operation.

While Stelvetite is more expensive than uncoated cold reduced steel, in many uses this higher cost can be offset by there being no need to apply normal finishes. Indeed, the total cost of this material is said to be about the same as applying a high quality enamel finish. Also, no secondary cleaning is required or other treatments.

A further useful property is that any slight blemishes occurring on the surface of the steel are unimportant since they are obliterated by the plastic coating.

Two reasons govern the choice of p.v.c. as the plastics material, firstly because it is easier to obtain a bond or strong gluing effect between p.v.c. and steel than with practically any other plastics material; secondly, p.v.c. will follow the form or shape of the steel very closely. Under any normal conditions which the plastic-bonded steel is likely to meet, p.v.c. does not shrink, compared with polythene or other plastics.

With this announcement by John Summers of a commercial production process which allows four-foot wide strips of plastics-bonded steel Britain is now ahead of the world. Also the British Iron and Steel Research Association is producing plastics-coated steel in strips of a few inches in a pilot plant, and it is known that two other British companies are developing the production of plastics-coated steel.

In the US at least two companies there, the US Rubber Corporation and the US Steel Corporation, are producing plastics-coated sheets and a number of other US companies are known to be nearing the production scale. Compared with John Summers' process, the US Rubber Co.'s is similar in type though different in detail. The US Steel Corporation in Pittsburg have recently installed a continuous plant for bonding plastics to steel. However, the plastic is applied as a paste and not as a finished sheet.

It will readily be realised that the applications of this new material are many. It could be used for all purposes for which steel sheet is now employed, but because it is a finished material in its own right, new uses for it will undoubtedly develop. The company themselves believe that the market for Stelvetite may eventually equal, if not surpass, the market for galvanised and zinc-coated sheet, which is of the order of several thousand tons a week.

RIC MANCHESTER SYMPOSIUM ON THE 'NEWER METALS'

Production and Properties of Beryllium

IN PRESENTING as detailed a picture as possible on the status of beryllium at the present time, Mr. L. R. Williams said that the nuclear properties of beryllium placed it in a unique position among the metals being considered and used for the construction of nuclear reactors. Its neutron absorption cross-section was the lowest of all metals, being approximately 1/6th of its nearest competitor, magnesium; additionally its cross-section for the scattering of neutrons was high and its atomic number was low. From the nuclear aspect, therefore, the metal was particularly attractive for use as a canning material, as a moderator and as a material for the production of reflectors.

Mr. Williams, of the Research and Development Branch, UKAEA Industrial Group, was giving his paper at the symposium on 'Newer metals' held jointly in Manchester last week, by the Manchester section, Royal Institute of Chemistry, the Society of Chemical Industry and the Chemical Society. Other papers presented were: 'Niobium, extraction and consolidation', by Dr. G. L. Miller (Murex Ltd.) and 'The extraction of zirconium', by Dr. A. Hock (Magnesium Elektron Ltd.).

Processes for the extraction of beryllium and methods for fabricating the metal were then considered by Mr. Williams. The only commercial source of the metal was beryl which was beryllium aluminium silicate and contained approximately 4 per cent beryllium metal. The main stages in the production of the metal from the ore were first of all to produce pure beryllium hydroxide from the beryl and subsequently to convert this to either beryllium fluoride or beryllium chloride.

Beryllium metal was obtained from the fluoride by reduction with magnesium. The metal was recovered from beryllium chloride by electrolysis in a fused bath consisting of a mixture of sodium fluoride and beryllium chloride.

Relatively Pure

Both forms of the metal were relatively pure, the electrolytic process being rather better from the point of view of metallic impurities, containing, approximately 500 p.p.m. metals as compared with approximately 2500 p.p.m. for metal obtained via the fluoride route.

Casting was the first method of fabrication detailed by Mr. Williams. Beryllium, he said, was normally melted in beryllia crucibles using standard vacuum melting equipment. The cast metal was quite brittle in tension and it had an abnormally high tendency to form very large grains on solidification which added to the difficulty of machining. It was hardly conceivable that it could be used in this condition for structural purposes unless the imposed stresses were very low and compressive in nature.

Of the powder metallurgical method the lecturer said: The brittleness of the cast product had turned the metallurgists' ideas to the possibilities of processing methods based on powder metallurgy techniques. The powder was normally produced by milling operations and in the case of the fluoride route it was necessary to introduce a preliminary casting operation from which multiple chip turning gave a product suitable for grinding. An increase in oxygen content was noted during these operations and the final oxygen content of the powder was of the order of 1.0 per cent. It was thought that the presence of oxygen films on the surface of the powder might play a useful part in inhibiting grain growth during processing.

Hot pressing of the powder or cold pressing followed by sintering gave a product which showed isotropic ductility in tension of 2-5 per cent. Mechanical working operations such as extrusion which might be applied either to the powder or to the pressings gave a product which was anisotropic. Extruded shapes, for example, might possess up to 15 per cent ductility in the direction of extrusion, but again the values for transverse ductility were low. Beryllium sheet had been produced which possessed a ductility of up to 30 per cent in all directions in the plane of the sheet. However, the ductility was again low at right angles to the plane of the sheet.

In the present state of knowledge, ductility of beryllium was such that it was a limitation to its widespread use at room temperature in comparison with other metals. Ductility should be considered under similar rates of stressing. However, insufficient data was at present available to enable any reasonable comparison to be made between either source of powder to methods of fabrication on this basis.

There was yet no full explanation available for the brittleness of the metal and it had yet to be proved, Mr. Williams stated, that the removal of impurities would improve the position. The present position therefore from the point of view of the nuclear design engineer was that the mechanical properties of the metal were such that it could only be used for components which were not subject to appreciable straining as a result of the stresses imposed during service.

In conclusion Mr. Williams said that full utilisation of the metal—and the gain of the important advantages which would result—would provide both the chemist and metallurgist with a great field of endeavour during the next few years.

Extraction and Consolidation of Niobium, by G. L. Miller

'THE first step in the production of niobium is to prepare a pure compound for reduction to the metal'. This was stated by Dr. G. L. Miller (Murex Ltd.) in his paper on 'Niobium, extraction and consolidation'.

Dr. Miller pointed out that the ore might be a tantalo-columbite containing more tantalum than niobium, or a columbite containing relatively small amounts of tantalum. Both types of ore, however, contained impurities such as tin, titanium, manganese and iron.

Treatment of the ore was such that niobium and tantalum were taken into solution and then processed to separate the base metals. The latest process for this operation, stated Dr. Miller, was solvent extraction. Separation of titanium from niobium was difficult—more difficult than the separation of tantalum.

The chlorination process studied by the UK Atomic Energy Authority was interesting; this entailed the chlorination of a ferro-alloy containing niobium, tantalum and titanium.

Distillation yielded a mixture of pure tantalum and niobium pentachlorides; the latter was reduced to the trichloride and separated from the more volatile tantalum pentachloride and finally reduced by hydrogen to metal. The process was more difficult than it appeared and had not been developed to commercial production.

Electrolytic production of niobium was not satisfactory, the lecturer reported. Reduction of potassium niobium fluoride with sodium was said to be satisfactory provided oxyfluorides could be avoided. The Fansteel process of reducing the metallic oxide with the carbide yielded metal with residual carbon and oxygen.

The best procedure for consolidation was to sinter the powder in a vacuum furnace. This permitted time for the removal of small quantities of oxygen and carbon usually present in the metal powder. The powder was pressed to bars and could be sintered by direct resistance or by heating in an induction furnace, but in both cases heating had to be gradual to avoid cracking of the bar by the hydrogen which was expelled at about 800 °C.

Oxygen was removed chiefly as carbon monoxide, and carbon might be added if insufficient was present. Oxygen was also removed by volatilisation of a lower oxide of the metal; this took place around 2,000 °C. Silica was also removed if oxygen was present to form silicon monoxide. The metallic nitride was decomposed and eliminated. The sintered product was soft and ductile and was readily fabricated.

It had been proposed to consolidate niobium by arc melting, said Dr. Miller, and this was proving more suitable than sintering, provided that the material being fed to the arc was almost free from oxygen, otherwise there was insufficient time to eliminate impurities. Sintered niobium had been successfully arc melted; this was not difficult but it was expensive.

★ THE PEP survey 'Graduates in Industry' (CA, 31 August, p.317) was greatly concerned at the annual scramble for the services of science graduates for industry. Alembic learns from the Manufacturing Chemists' Association that in the US competition is so keen that a 'no holds barred' atmosphere has sprung up.

To curb abuses and to restore to normal the relations between industry, student and college, the MCA has established a set of principles and practices for recruiting of graduates, which have since been sponsored by the US Chamber of Commerce for all industries.

The MCA code calls on employers to give students factual information and not exaggeration; to make it clear that opportunities for advancement depend on ability and effort. On the financial side, employers must not influence students with special inducements, such as high overpayment of travel expenses, elaborate entertainment, or by scholarships or summer work which carry commitments to work for the employer after graduation.

★ A LITTLE more information about the proposal to ship liquid methane to this country from abroad was given by Sir Henry Jones, deputy chairman, Gas Council, when answering questions about the annual report of the Gas Council on 8 October. He suggested that possibly 20 to 30 per cent of our gas supplies might eventually come from this source, at a cost 'appreciably' below that from coal. A ton of methane would replace six to seven tons of coal.

As to the source of the methane, Sir Henry would only say that it would come from 'America.'

Sir Henry's statements have done little to remove the confusion existing about this subject and Alembic can only emphasise his suggestion in last week's CHEMICAL AGE (p.554) that an authoritative statement giving more details of the project should be made as soon as possible. Both industry and the public are interested and have a right to know what is being done.

★ ALEMBIC'S mention last week of the US artificial satellite came before the momentous news from the Soviet Union. Since then, 'red moons' and 'blip balls' have been on everyone's lips. As the picture becomes clearer, it seems that there are several important differences between the satellites of the two nations. The US sphere, as we reported last week, has a magnesium shell with seven layers of insulating material. According to Wednesday's *Pravda* the Soviet sphere has a body of aluminium alloys and it is filled with gaseous nitrogen forcibly circulated during flight to maintain the necessary temperature.

Perhaps the greatest difference between the two spheres of very similar size is the weight; 28 lb. for the US satellite as compared with 180 lb. quoted by the Russians for theirs. At the Royal Society press conference last Tuesday, Alembic was told by Dr. Stephens, deputy director of the Royal Aircraft Establishment, Farnborough, that the Russians very probably used a three-stage rocket to launch their satellite, the first two stages being liquid-fuelled and the final stage, now trailing behind the sphere, solid-fuelled.

★ A NEWS item concerning the New York Chemical Fair, that appeared in our issue of 7 September has caused some misunderstanding. It was then stated that the first-ever zirconium fabrications were to be shown at the fair. This reference was intended to apply to their inclusion in the exhibition for the first time, a fact which should have been more clearly put.

Alembic hears from Dr. G. L. Miller of Murex Ltd., Rainham, that zirconium parts were fabricated several years ago both in the US and in this country. The US Bureau of Mines at Albany did the major development work on zirconium and produced a number of parts and used them for various purposes. Murex were also producing components in this metal at least five years ago.

Alembic is only too pleased to give credit where it is due.

★ A NEWLY published report by the Atomic Energy Research Establishment (AERE HP/R 2017) on the radiological dose to persons in the UK due to debris from nuclear test explosions before January 1956, will interest many chemists. It briefly gives the methods used to measure the amount of radioactive material in the air and deposited on the ground.

Since the spring of 1954, ^{90}Sr has been deposited on the UK at a rate of 2.3 mc/km²/year and the concentration on the ground reached a value of 4.5 mc/km² on 1 January 1956. Due to the hold-up in the stratosphere of dust from thermonuclear explosions, the ground concentration of ^{90}Sr from weapons exploded before 1 January is expected to increase gradually and to pass through a maximum value of 14 mc/km² in about 1968. A further contribution will, of course, be added by weapons exploded since 1 January 1956.

If the present rate of firing is continued, an equilibrium value of 200 mc/km² of ^{90}Sr may be reached in about 100 years time. The team responsible for the report (N. G. Stewart and R. N. Crooks and Miss E. M. R. Fisher) calculate that a typical inhabitant of these islands will receive a total dose of 1.7 mc of external radiation over a period of 50 years as a result of weapons exploded before 1 January 1956. If the present rate of explosions continues, the estimated equilibrium dose per person per generation will be 27 mc.

★ THERE must be many disappointed officials in West Germany as a result of the decision of Knapsack-Griesheim not to hold the customary anniversary party to mark the recent 50th anniversary of their Knapsack, Cologne, plant. By tradition, work comes to a standstill while numerous officials and contacts are wined and dined.

For this jubilee, however, Knapsack-Griesheim marked the day by a 'simple festive hour among our workers'. The money that would have gone on an elaborate party is to be spent on research. The company has opened an account for support of science and research and has transferred to it a 'considerable amount'. The account is to be freely available to the various research organisations in West Germany.

Knapsack have asked their business friends not to send flowers or presents, but to send contributions to the new research account.

★ THE CHANGE of policy on the part of the Federation of British Rubber and Allied Manufacturers was marked at a recent council meeting when 17 companies manufacturing chemicals, machinery or components for the British rubber industry were accepted as associate members. The new policy stems from the annual meeting in June, when the title of the Federation was changed.

The 17 suppliers now in the associate membership class represent an initial list which the Federation's council decided to approach and applications since received will come before the council shortly. Companies that are substantial suppliers to the industry and would like to become associate members should contact Mr. S. C. Covell, director at 43 Bedford Square, London WC1.

★ ALEMBIC learns from UNESCO that bulrushes are being planted on a vast scale on the German Baltic coasts as a new raw material for the production of paper pulp. The *Scirpus lacustris* variety of marsh reed is also to be grown in coastal regions of South-West Africa, partly as a protection against erosion.

Bulrush, containing much cellulose, can be used for foodstuffs for animals. Several countries interested by the many uses of the bulrush have asked for information from the Plön Hydro-Biological Institute of the Max Plank Society, who have done much work on its chemistry.

Alembic

NEW WORK ON VIEW AT CRL OPEN DAYS

OPEN days at the DSIR Chemical Research Laboratory at Teddington, Middlesex, last week attracted about 1,000 visitors, who were able to inspect much of the work in progress, which included a wide range of new projects. On Friday, Dr. D. D. Pratt, director, and his staff welcomed members of the Chemistry Research Board, Department of Scientific and Industrial Research, heads of other research organisations and other guests.

Among the more interesting of the many new experiments were high-voltage paper electrophoresis; membranes for use in dialysis and polymer fractionation; sulphide production by anaerobic digestion of sewage sludge enriched with sulphate; solvent extraction of thorium; purification of metals.

Paper Electrophoresis. Recently developed by the organic group, this high-voltage apparatus has two important advantages over the more usual low-voltage equipment. Working at up to 10,000 volts, it can separate much more quickly (in one test in 20 minutes against six hours) and provide much sharper diffusion. Initially it is planned to work on the phenols, particularly the xylenols.

This high voltage apparatus is also being used by Tate and Lyle chemists and was the subject of a note in *Nature* of 14 September.

Methoxymethyl Nylon Membranes. In the high polymers group work on show included the production by gel casting and evaporation of methoxymethyl nylon membranes. These have been used for osmometry of aqueous solutions and it is thought they may find industrial application in separations using dialysis. After a suitable conditioning procedure, the membranes can also be used in certain non-aqueous systems and are showing considerable promise in the fractionation of polymers (e.g. polystyrene) by selective diffusion.

Recovery of H_2S. A model for a proposed large pilot plant at the Northern Outfall Works, Beckton, London, E6 was used in the microbiology building to demonstrate a new process for the recovery of H_2S from sulphated sewage sludge. Sludge plus 6 per cent $CaSO_4$ is fermented anaerobically at 30°C in a Towers fermentation vessel to produce H_2S, which remains dissolved in the sludge. The sludge is circulated to a stripping column, where a gas mixture of N_2 and 30 per cent CO_2 is bubbled through the sludge to remove the H_2S.

In previous experiments, a stripping gas was blown through the sludge in the fermentation vessel. It is said that with the new method more efficient recovery of H_2S should be possible with a suitably designed stripping column. Another advantage is that the heat required to maintain the sludge at 30°C is applied to the outside of the stripping column and assists the release of H_2S.

The present 50-gal. pilot plant at Beckton will be replaced with the new 400-gal. pilot installation early in the New Year.

Solvent Extraction of Thorium. The recovery of 200–250 p.p.m. of thorium from uranium-bearing liquors with di-2-ethylhexyl orthophosphate, was demonstrated in a laboratory scale model set up in the radiochemistry building. The liquors, fed from ion exchange units contain impurities and the object of the experiments has been to produce extract thorium in the maximum degree of purity.

The method is claimed to be highly selective and being a simple three-stage counter current contacter process could be economically reproduced on a larger scale. In the first and second stages mixing is carried out. At the third stage better than 95 per cent purity thorium is obtained. Next, the entrained aqueous feed is treated by a weak acid such as 0.01 N sulphuric acid, being passed by counter-current across the entrained solution with significant loss of thorium. Thorium is stripped from the solvent into the aqueous and the solvent is re-used.

Purifying Mercury

Purification of Mercury. In the Hales building (inorganic group), a simple process of washing with dilute nitric acid and then distillation in vacuo was demonstrated. Using radioactive tracers, it had been shown that this method reduced the amount of common impurities to below 1 part per 100 million. The following results were obtained with impurities added in amounts of about 1 part per 100,000.

	Upper Concentration Limit
Tin	0.2 per 100 million
Zinc	0.2
Antimony	0.07
Indium	0.002
Silver	0.01
Gold	0.0006

In the brightness test, as little as 1 or 2 parts per 10 million of base metals produced a readily visible film on the surface of mercury. Noble metals did not show this effect.

Zone melting experiments in the same laboratory have shown that indium triiodide may be purified from lead by zone refining, although this zone heating process failed to purify indium metal from lead.

New Insecticides Described at International Congress

AT THE FOURTH International Crop Protection Congress held in Hamburg recently, four new insecticides were reported. It was claimed that these insectjcides had properties which overcame limitations of existing products. All four are systemic insecticides.

Two of the insecticides are phosphorus compounds. One is Phosphamidon, developed by Ciba AG in Switzerland, which is stated to have a half-life of two days in the plant and to kill leaf-sucking insects and many grubs, larvae and caterpillars. The other is Phosdrin, produced by Shell Development. It is vinyl phosphate. Claims made for Phosdrin are that it is very short-lived in crops, is effective in very small quantities (one to eight ounces per acre) and most crops can be eaten 24 hours after treatment. Control of some 35 kinds of insects on 25 different crops is reported.

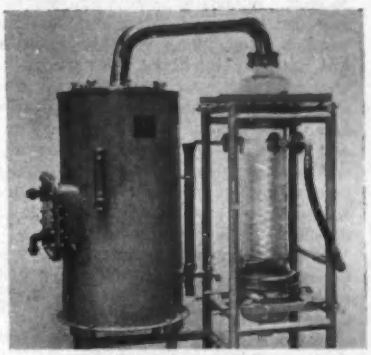
Farbwerke Hoechst have developed a chlorinated organic sulphur compound, Thiodan, which is stated to be toxic to over 100 kinds of insect pests. The second Hoechst product is Hoe 2705, designed for use against beetles and various human and animal parasitic insects.

Hard Water Still by Apex Construction

A HARD water still fitted with a concentrator which continuously bleeds off impurities from the evaporator has been supplied by Apex Construction Ltd., 15 Soho Square, London W1, to an Irish University.

The still, model H10S, is made from copper and brass with the evaporator heavily tinned. It is built with a glass condenser for observation of the condensing and cooling conditions of the distilled water.

A steam pressure of 25 to 55 p.s.i. is required. Output is 10 gallons an hour at about 40 p.s.i.



Hard water still supplied to an Irish university by Apex Construction. The condenser, which is made of glass for observation of the condensing and cooling conditions, can be seen on the right

UK and International Atomic Agency

Chairman of the British Atomic Energy Authority, Sir Edwin Plowden, who attended the first meeting of the International Atomic Energy Agency in Vienna on 1 October, said that the UK's chief contribution to the Agency would be to make available Britain's technical experience and basic information. The Agency is to be offered 20 kg. of uranium-235 or pure fissile uranium by the UK which would also undertake development of reactor types for small countries.

Finland Liberalises Chemical Imports

THE Finnish authorities have issued a list of goods which may be imported without quantitative restriction from certain countries, including the UK and most other western European countries. The list of liberalised goods includes the following:

Magnesite, gypsum, insulating compounds and moulding powder, asbestos and talc, kieselguhr, fluorspar and cryolite, ores, slags and ash, phenol and cresol, phosphorus, mercury and amalgams, compressed gases, nitric acid, hydrochloric acid, phosphoric acid and their derivatives, boric acid, formic acid, oxalic acid, tartaric acid, citric acid, lactic acid, sodium hydroxide, potassium hydroxide, ammonia solution, magnesium oxide, magnesium hydroxide, barium oxide, barium hydroxide, aluminium oxide, aluminium hydroxide, manganese oxide, manganese hydroxide, lead oxide (*litharge*), sodium tetraborate (*borax*), sodium carbonate, sodium hydrogen carbonste, potassium carbonate, ammonium carbonate, calcium carbonate, magnesium carbonate, barium carbonate, sodium nitrite, potassium nitrite, potassium nitrate, sodium silicate, potassium silicate, polyphosphates.

Sodium sulphite, sodium sulphate, sodium hydrogen sulphate, potassium sulphate, magnesium sulphate, zinc sulphate, iron sulphate, aluminium sulphate, chromium sulphate, aluminium potassium sulphate (*alum*), nickel sulphate, ammonium nickel sulphate, copper sulphate, sodium thiosulphate, sodium sulphide, potassium sulphide, potassium polysulphide (*liver of sulphur*), potassium chloride, salt licks, ammonium chloride, magnesium chloride, calcium chloride, barium chloride, mercury chloride, bleaching powder, sodium chlorate, potassium chlorate, sodium chromate, sodium dichromate, potassium chromate, potassium dichromate, lead acetate, compounds and colloidal preparations of precious metals, silicon carbide.

Calcium carbide and other carbides, certain chemicals and chemical products for industrial use, monomeric halogenated hydrocarbons, butanol, acetone, certain solvents and diluents, aniline, naphthylamine, nitroaniline, phenylenediamine, tolylenediamine, toluidine, xylidine and their salts, naphthol, resorcinol and symdiphenylthiourea, mononitrobenzene, mononitrotoluene, mononitroxylene, colour bases and their salts, tannic acid, 3:4:5-tri-hydroxybenzoic acid, pyrogallol, artificial sweetening agents, activated charcoal, bone charcoal and bone black, celluloid, cellulose acetate, viscose, other cellulose derivatives n.e.s., artificial plastic materials based on casein (e.g. *Galalith*), gelatin or starch, synthetic resins derived from phenols, urea or phthalic acid, cured or uncured, even if with incorporated paper or fabric, other artificial plastic materials with the exception of artificial stones, unworked and waste, disinfectants, plant protection preparations, etc., lecithin, peptone, nuclein and preparations thereof, sera, vaccines and bacterial preparations, medicaments containing alcohol, medicinal wines, alcoholic solutions and mixtures containing alcohol, not potable, medicaments put up for retail sale, chemical preparations and medicaments, photographic films, plates, paper and chemical products for use in photography put up for retail sale, tanning extracts, organic colours, lamp black, chalk, ground or washed, barytes, ground or washed, barium sulphate, earth colours and iron oxide colours, lithopone and titanium white, red lead, ultramarine, colour lakes, metallic colours and printing colours, casein, albumin, gelatin and glues, black powder, fertilisers, glass laboratory articles, tubes and rods.

Ammonium chloride, sodium nitrate with a nitrogen content of more than 16 per cent, calcium nitrate with a nitrogen content of more than 16 per cent, calcium cyanamide with a nitrogen content of more than 25 per cent, urea with a nitrogen content of more than 45 per cent dry weight, sodium nitrate with a nitrogen content of not more than 16 per cent, ammonium sulphanitrate, ammonium sulphate, calcium nitrate with a nitrogen content of not more than 16 per cent, calcium nitrate-magnesium nitrate, calcium cyanamide with a nitrogen content of not more than 25 per cent whether or not impregnated with oil, urea with a nitrogen content of not more than 45 per cent.

Cost of Underground Coal Gasification

THE COST of making gas from coal underground—using seams which are uneconomic to mine—is likely to be even less than forecast last year, and much less than conventional fuels. This view was expressed last Saturday by Mr. C. A. Masterman, who has been actively engaged for some eight years with underground gasification, first with the Ministry of Fuel and Power and the National Coal Board, now as a full-time member of the team brought together by Humphreys and Glasgow Ltd. as contractors to the National Coal Board appointed to develop this project.

Mr. Masterman was reading a paper on the subject to the North of England Institution of Mining and Mechanical Engineers at Newcastle-upon-Tyne.

He said that this gas used to generate electricity might cost about 4d. per therm in an installation constructed on the basis of present-day experimental technique. This compares with 4d. per therm, the average cost of coal to power stations, and 6d. per therm, the cost of imported coal.

By 1964 improvements in technique and streamlining of engineering work might bring the cost of gas made underground to 1.8d. per therm.

A pilot plant is now being provided at Newman Spinney, Chesterfield, to serve a 3,750 kW. generator to be built by the Central Electricity Authority. The plant is planned to be in operation by the end of next year.

According to Mr. Masterman, recent developments since the publication of the official Blue Book, 'British Trials in Underground Gasification 1949–1955', HMSO for Ministry of Fuel and Power, 1956, have gone far to confirm a substantial reduction in the cost of gas production by underground gasification compared with earlier techniques, which themselves appeared cheaper than conventional fuels.

Convincing evidence such as to justify the planning and preparation of the first commercial system should not now be long delayed, he suggested, adding that there seemed good prospects that this stage would be reached by 1959.

Gas Council Annual Report

A NET surplus of £3,803,856 was reported by the Gas Council for the year ended 31 March 1957. All the area boards had disposable surpluses, the total being £8,409,196. Some of this was placed to reserve funds, some to replacement and obsolescence reserves and some to taxation reserves.

Work is being carried out on the complete gasification of coal. It is believed that the problems involved can be solved most quickly by first gasifying oil feedstocks. A 7½ million cubic feet a day plant is to be erected in the area of the North Western Gas Board, and will be operated as part of the Council's research programme.

Demand for chemical products is reported to have been steady throughout the year and the demand for refined chemical products is growing. Farmers are showing increased interest in the use of ammoniacal liquor as a fertiliser.

The Annual Report of the Gas Council was laid before Parliament on 8 October.

Shell K-2 Converters installed at Partington

FOLLOWING successful test runs with a pilot scale unit, the Shell Chemical Co. Ltd. are installing, at their Partington plant, two full-scale catalytic converters for the selective hydrogenation of acetylene in ethylene.

To remove acetylene down to very low concentrations use is made of selective hydrogenation using supported precious metal catalysts, a range of which, tailored to suit specific gas streams, has recently been introduced into this country from the US. Developed in the research laboratories of Baker and Co., Inc., of Newark, New Jersey, and proved in US plants, these catalysts are now being manufactured in this country by the Baker Platinum Division of Engelhard Industries Ltd., 52 High Holborn WC1.

Baker Platinum claim that acetylene removal catalysts not only operate at high throughputs, but are also capable of being regenerated *in situ* when their activity falls below a certain level. These catalysts form the latest addition to the Baker range of gas purification catalysts; others in the series are specifically designed for the gaseous phase removal of oxygen and hydrogen from other gases, the oxidation or reduction of carbon monoxide to carbon dioxide or methane, the reduction of oxides of nitrogen in effluent streams (tail gas from ammonia oxidation plants), and the oxidation of acetylene and other hydrocarbons in air (air liquefaction).

UK Man-Made Fibre Output Falls

Output of man-made fibres in the UK, in August dropped from 43.2 million lb. to 35.2 million lb., as a result, it is reported, of holidays. Production was, however, five per cent higher than in August 1956, and for the first eight months of the year has gained by almost 3 per cent. Continuous filament yarn output exceeded the staple fibre, which dropped during August from 22.8 million lb. to 17.1 million lb. A small fall only was noted for continuous filament yarn, from 20.5 million lb. to 18.1 million lb. There is a big demand for filament yarn for the tyre trade, but recently output has tended to be greater than the take-up by tyre manufacturers.

Fire-proof Textiles Research

At the Shirley Institute, the British Cotton Industry Research Association centre at Didsbury, it is reported that experiments are being directed at production of a finish to make textiles fireproof. Dr. D. W. Hill, the association's director, stated that a flame-proofing product that was cheap and easy to apply had already been achieved. It did not, however, provide permanent protection, being no longer effective after about seven washes.

Will

MR. ARTHUR THOMAS BRAYBROOKE, 27 Arundel Road, Cheam, Surrey, formerly of Sutton, a director of Evans, Gray and Hood Ltd., crude drug merchants, who died on 4 June last, left £16,842 12s 6d gross, £16,544 1s net value.

MERCURY DETERMINATION BY DIRECT DISTILLATION

Four Papers at SAC Autumn Meeting

FOUR papers were presented and discussed at the first autumn ordinary meeting of the Society for Analytical Chemistry, held on 2 October at the Royal Society, Piccadilly, London W1, with Dr. J. H. Hamence, president, in the chair. These were: 'The analysis of "ferrites" by means of EDTA', D. G. Timms, GEC research laboratories; 'Determination of mercury by direct distillation in its compounds and preparations', H. E. Brookes and L. E. Solomon, standards department, Boots Pure Drug; 'A system for the determination of certain trace metals in crops', W. D. Duffield, Welbeck Biological Laboratory, London W1; and 'Some applications of X-ray spectrography', H. I. Shalgosky, UKAEA, Woolwich Outstation, Royal Arsenal, London SE18.

As the advantages of separating metallic mercury by distillation appeared attractive, attempts were made by H. E. Brookes and L. E. Solomon to modify the apparatus, which consisted in general of a horizonal tube filled with magnesite, lime, the sample mixture, lime and an asbestos plug. The open end of the tube dipped into water in a beaker where the mercury collected.

Objections to the method were that the Pyrex tube frequently softened and collapsed under the heat required before the experiment was completed; or the tube stuck to the iron guttering and shattered on cooling. The delivery tube was a probable source of loss as it was stained with black tailings, presumably mercury, which could not be removed for weighing. Considerable channelling of gases in the tube occurred with the possibilities of the mercury being incompletely distilled. Also the tube could only be used for one experiment, even if it were successful.

A vertical report consisting of a fused silica flask fitted with a delivery tube and receiver in one piece was developed, so that the whole would all go into a beaker to dissolve out the mercury.

Distillation

The method employed is to distill the mercury-containing material in the presence of iron filings and to pass the vapour through a mixture of calcium oxide and iron filings. The mercury is trapped on zinc wool in the receiver, the amalgam being dissolved in nitric acid and titrated with N/10 ammonium thiocyanate in the usual way.

With experience of the method the quantitative recovery of mercury from its salts and other preparations was investigated starting with mercuric chloride. Recoveries of only 95 per cent were obtained. Various reducing substances were tried mixed with the mercuric chloride, all of which were unsuccessful. However, 2 g. of sucrose provided the right atmosphere and sufficient gas to drive all the mercury into the receiver within 15 minutes.

TABLE 1
(using procedure plus 2 g. sucrose)
Mercury Compounds

Compound	Distillation %
Mercuric chloride	99.1
Mercurous chloride	99.3
Mercuric oxide	99.2
Mercuric sulphide	99.5
Mercuric iodide	99.1
Mercuric oxycyanide	99.2

TABLE 2

Compound	% Hg. Distillation	% Hg. Other methods	% Recovery
Mercury ammoniated	77.7	78.4	99.1
Mercurochrome	25.6	25.2 BPC	—
		38.1 B.P	100.0
Mersalyl	38.6	38.6 Hydrolyses	
Methyl mercury chloride	79.1	76.0	98.6 (calc.)
Phenyl mercury p-hydroxy-benzoate	47.6	47.65	99.8
Ethyl mercury phosphate	71.5	71.6	99.8
Phenyl mercury nitrate	63.0	63.1	99.8

After a number of results had been obtained on the same sample of mercurous chloride, it was noted that there was a small, fairly constant loss of mercury. The receiver was therefore modified, by fitting it with a small bulbous funnel packed with glass wool. Fairly constant losses of between 0.22 and 0.6 mg. were found which these investigators believe may be due to loss of mercury vapour.

Determining Interference

Distillations have been carried out on mercurous chloride mixed with chlorine, bromine, iodine, sulphur, benzene hexachloride, dieldrin, bismuth subgallate, boric acid and lead arsenate, to determine the possibilities of interference by these substances. Only iodine, bromine and benzene hexachloride proved to have any measurable effect on the recovery. Addition of copper filings to the contents of the stem of the flask enabled satisfactory recoveries to be obtained with iodine and bromine present. If the amount of benzene hexachloride was limited to 2 g., satisfactory recoveries were obtained when sulphur was present, the mercury distilled free from tarry matter. As a result of this finding 1 g. of sulphur has been added to the flask to clean up the distillate, particularly from ointments.

Because of difficulties in introducing ointments into the flask, not more than 1 g. of ointment can be used. This limits the ointments to those containing 5 per cent of mercury if satisfactory recoveries are to be obtained. The hope was expressed, however, that an apparatus modified to be heated in an electric furnace, which was in construction, would enable more of the sample to be taken.

From Table 3 it can be seen that recoveries obtained were well within the tolerances required for such preparations except in the case of ointment of oleated mercury.

TABLE 3
Synthetic Mixtures

Mixtures	Hg. (mgm.) Calc.	Hg. (mgm.) Found	% Recovery
Tablet—santonin	137.1	135.9	99.2
Jalop and calomel	190.2	189.0	99.4
Tablets—calomel	250.5	248.8	99.2
Rhubarb & colocynth Co	273.5	272.5	99.5
	186.5	187.1	100.3
Oleated mercury	186.5	185.4	99.3
	186.5	186.0	99.6
Ointment $HgNO_3$ Strong	67.0	66.8	99.6
	67.0	67.0	100.0
	67.0	66.6	99.3
Ointment	46.3	44.1	95.3
Oleated mercury	46.3	43.7	94.4

Brookes and Solomon considered that the distillation method described was a simple means of isolating mercury from a wide range of its compounds and preparations. It was rapid and could be carried out with a known degree of accuracy. They pointed out that where the amount of mercury taken was small, the error, which was a constant one, assumed large proportions. Modifications to the receiver have, however, shown promise in reducing the error due to volatility of mercury. The investigators hope to use the method in due course as a routine procedure for semi-micro and micro-quantities.

Discussion

Dr. R. E. Stuckey remarked that the loss of mercury in the experiments appeared to be a definite amount. Did it vary with the apparatus?

Mr. Solomon said the amount did vary. They believed that the loss was due to vapour pressure.

When asked how the final estimation of mercury was carried out, Mr. Solomon said that the whole receiver was placed in a beaker and the mercury dissolved in nitric acid. The mercury solution was then titrated with N/10 thiocyanate. Losses were of the order of 0.2 mg. With large amounts of mercury the loss was equivalent to 0.1 mg. mercury.

Dr. R. F. Milton stated that it was his opinion that the thiocyanate titration was not sensitive to less than 2 mg.

Reference was made by Mr. Solomon to a recently published Japanese paper regarding sensitivity of the thiocyanate method. A volume of 30 ml. had been titrated with N/10 thiocyanate with considerable accuracy.

Dr. J. Hallam noted that an accuracy of 99.6 was frequently found in the authors' experiments. He therefore asked whether large amounts of titrant had been involved. Replying, Mr. Solomon said that 35 ml. of N/100 thiocyanate had been employed, and results were certainly to 0.5 ml. accuracy.

Dr. J. H. Hamence spoke in favour of the thiocyanate method, saying he considered it preferable to other methods. Mr. Solomon agreed that they had found that thiocyanate gave a very good end point. He said that he had noted in the report of the mercury committee of British Insecticide Manufacturers that the thiocyanate method had been investigated and that a 99.8 per cent accuracy was reported.

The method had been used for strong ointments of mercury and the end point was sharp with excellent recoveries. It had been used for this work over a period of years. Dr. A. C. Garrett said in the mercurous chloride experiments referred to by Brookes and Solomon, several different workers had carried out the estimations, with their results all in agreement.

Mr. R. C. Chirnside queried the possibility of obtaining a pure mercury salt. Dr. Garrett asked Mr. Chirnside how one obtained a pure mercury salt and what methods of test he would apply to prove the purity. Mr. Chirnside suggested starting with very pure mercury to produce the mercury salt. Such mercury was obtainable as he had observed samples at the Chemical Research Laboratory on its open day.

Mr. Brookes said that mercury had been examined at definite intervals, and the losses had varied between 1.1 and 1.9 mg. with 99.4 per cent recovery.

Another questioner asked whether cooling with liquid air had been tried. Mr. Solomon said that as the apparatus and method were being developed as a routine bench test for mercury preparations, particularly pharmaceutical, they wanted the method to be a simple and inexpensive one.

When asked if he wished to comment further, Dr. Milton said that he had been interested in the thiocyanate as a microtechnique. He had found that the reaction did not go to completion and the end point was not sharp.

Determining Trace Metals in Crops by Chromatography

TO meet the need for a rapid routine evaluation of trace element levels in crops, a rapid, simple, and economical of space method has been chosen. Final assessments rely on visual matching against standards, which has been found satisfactory.

Ten milligrams of finely ground sample is ashed at 550°C. Silica is precipitated jn crystalline form by twice repeat evaporation with hydrochloric acid and heating for two hours on a hot plate. The ash is then dissolved in 0.5 ml. of 50 per cent hydrochloric acid.

For the chromatographic separations, Whatman No. 1, Pattern CRL slotted paper is used, so that 10 separate aliquots can be treated simultaneously Sample solution, 0.01 ml., is applied in an even band about 1 cm. from bottom of paper strip, which is then formed into a cylinder, clipped together and placed in a tall-form 600 ml. beaker, which is floated in a 2-l beaker of boiling water for three minutes to ensure the optimum drying effect.

Copper, cobalt and nickel are determined jn an 0.02 ml. portion by upward-flow chromatography with ethyl methyl ketone—hydrochloric acid—water in the ratio 15:3:2 as solvent, followed by development with rubeanic acid (0.1 per solution) when the coloured bands due to nickel (purple-blue at the bottom), cobalt (yellow in the middle) and copper (olive green at the top) will appear. The coloured bands are matched against standard papers, the convenient range being 0.2 to 2 μg.

Molybdenum is similarly determined in 0.02 ml. portion, n-butyl alcohol saturated with 10 per cent hydrochloric acid being used as solvent and development with toluene -3:4-dithiol. An apple-green band develops about half-way up the strip which can be matched against standards in the range 0.2 to 2 μg.

Sensitivity may be increased by diffusing butyl acetate up the dried paper just to the upper limit of the original green area. Detection of 0.005 μg and matching jn the range 0.01 to 0.1 μg is then possible.

If a large excess of iron (more than 100 times) makes separation difficult, a larger aliquots must be used. Thus 0.25 ml. of original extract is pipetted into a narrow stoppered test tube, diluted with 5 ml. water and 2 ml. 10 per cent potassium thiocyanate and 0.4 ml. 40 per cent stannous chloride in concentrated hydrochloric acid added. After mixing, 0.5 ml. of butyl acetate is added and the tube again shaken. After separation into two layers, the butyl acetate is withdrawn, using a capillary pipette and transferred to a narrow tube of about 2 mm. bore. The yellow colour of the molybdenum complex can then be compared with a set of standards in similar tubes in the range 0.2 to 2 μg.

The presence of zinc may be shown by spraying either of the chromatograms described above with a weak solution of dithiozone jn carbon tetrachloride, into a 10 ml. stoppered test tube containing 1 ml. of one per cent hydrochloric acid; 0.01 ml. of solution is pipetted, and 1.0 ml. of pH 5.0 buffer (equal volumes of 2 N sodium acetate and 2 N acetic acid), 1.0 ml. of 25 per cent sodium thiosulphate are added, followed by 1.0 ml. of 0.002 per cent dithiozone in carbon tetrachloride. After vigorous shaking for one minute the layers are allowed to separate, and the colour in the carbon tetrachloride layer is matched against standards in the range 0.2 to 4 μg. The band produced does not permit of quantitative evaluation.

Boron is determined chomatographically using curcumin as a colour reagent. The complex thus formed after treatment with alkali gives a blue-green colour, not produced by iron, titanium, vanadium or molybdenum.

An amount, 0.02 ml., of extract is applied to the CRL/1 strip; the paper is then sprayed with curcumin reagent (0.002 per cent curcumin plus 1 per cent oxalic acid in methylated spirits) and dried for two minutes jn an oven at 100°C, after which it is placed in a few mm. of methylated spirit. After diffusion to the top of the pink-coloured test band the paper is dried and then placed in a few ml. depth of freshly prepared 0.5 per cent caustic soda. This is allowed to diffuse up the paper until the purple colour produced by the excess curcumin reagent just passes clear of the stationary blue-green boron band. The intensity of this band js then compared with that of standards simultaneously prepared in the range 0.2 to 2 μg. Matching must be carried out within 20 to 30 minutes.

Manganese may be conveniently determined by the familiar periodate oxidation to permanganate. To 0.25 ml. of extract in a 6 x 1 in. test tube are added 0.4 ml. H_2SO_4 0.5 ml. HNO_3 and 0.1 ml. phosphoric acid, together with a few drops of silver nitrate to catalyse the reaction. The tube is heated to fuming, cooled and again heated after addition of 1 ml. of water. Then 7 ml. of water and 0.1 gm. of potassium periodate are added and the tube boiled for five minutes and placed in a boiling-water bath for two hours. The solution may be suitably diluted according to intensity of the permanganate colour before matching against standards.

Discussion

Mr. Duffield was asked what sort of order of reproducibility was obtainable with his method and how did it compare with the order of accuracy. In reply the lecturer said that if 0.2 μg. steps were required the accuracy was not very good. For his purpose, he obtained results within plus or minus 5 per cent with suitable aliquots. Matching was quite simple, however, several workers agreeing very easily.

Asked what was the effect if one element (e.g. mercury) was present in greater quantity than others, Mr. Duffield said if such an element as mercury was present, it could be fitted into the scheme. He believed that butanol acetic acid could be used for mercury. The mercury was found to travel on the paper chromatogram but all other common metals remained at the start of the chromatogram. The system he used would separate really large amounts of cobalt and nickel.

Dr. J. H. Hamence referred to the method and molybdenum. He thought that 0.1 dithiol in amyl acetate—Bagshawe's last modified form—with washing in hydrochloric acid was the most sensitive method. Mr. Duffield said he had found that his system worked in checking trace elements in crops, but it was not suitable for testing trace elements in soils.

Dr. Hamence then remarked that for cobalt and nickel the paper chromatogram had proved more useful in their work than colorimetric work.

Another member asked Mr. Duffield whether manganese could be determined by his method. Why was it necessary to maintain temperature at boiling point and to use silver nitrate. Was there a possibility that precipitates might be locked up in silica and what was the accuracy. Mr. Duffield assured this questioner that the method was satisfactory for general routine assessment. Silica could be got rid of with hydrofluoric acid. With regard to the value of silver and maintaining the boiling point, Mr. Duffield referred to papers by Richards (*Analyst*, 1936, 55, 554) and Koroleff (*Acta. Chem., Scand.*, 1947, I, 503) which stressed the need of silver as a catalyst to eliminate inconsistency with very low concentrations.

Dr. Hamence then mentioned manganese and the periodate method and the need for phosphoric acid.

Dr. Milner wanted to know if Mr. Duffield had estimated amounts of boron using the paper chromatogram.

Mr. Duffield said that 0.2 to 2 μg. could be ascertained, but he regarded the paper chromatogram as a combination of spot test and chromatography. The boron band did not move. With molybdenum, 90 per cent only travels.

Asked how much could be got off the paper band Mr. Duffield said only $^4/_5$ could be obtained from the chromatograph band.

In obtaining results of extractions what happened with boron when volatilisation occurred, queried one SAC member. If some were lost in this way, Mr. Duffield said, he still obtained very consistent results.

He carried out all his estimations in the original crucible or in one of platinum. Dr. G. W. C. Milner then asked about boron recoveries. Mr. Duffield said that his errors had been of the order of $\pm$ 10 per cent recovery. It was suggested, by Dr. Milner, that the technique could be improved by having a condenser. Replying, Mr. Duffield said that the method as applied was quite adequate for his crop estimation.

X-ray Spectrography

X-RAY spectrography was analogous to ordinary emission spectrography in that the sample was excited to emit a characteristic radiation, the intensity of which was related to its concentration in the sample. This was stated by H. I. Shalgosky in his paper on 'Some applications of X-ray spectrography'. Excitation was carried out with X-rays from an electronically stabilised tube and the fluorescent radiation, after dispersion by diffraction in a crystal, detected with a Geiger counter.

The technique has generally been used in two ways: (a) for rapid routine analysis, e.g. of steels and petroleum, and (b) for determinations which are very difficult by other methods, e.g. the determination of zirconium in hafnium, niobium in tantalum and thorium in monazite sand.

The UK AEA, said Shalgosky, had found the technique useful for both types of analysis, and he quoted the following examples.

Determination of uranium in ores: Analysis of fractions arising from the application of experimental concentration techniques to crude ores was a long process using a standard chemical method of separation, and a polarographic finish. The general composition of the samples did not greatly vary within a series and it was therefore possible to determine the uranium content directly in a 1 gm. sample, by the X-ray method. With 0.3 per cent uranium present, a determination took about five minutes and the coefficient of variation of the result was about 2 per cent. Results obtained from a series of samples have been compared with those obtained polarographically.

Determination of strontium in milk powder ash: Here again the general composition of the samples was constant and a direct determination was possible. A counting time of 30 minutes gave a coefficient of variation of about 10 per cent with a sample containing 30 p.p.m. strontium. Results obtained by three other methods, namely, radioactivation, optical spectrography, and flame photometry, and the time taken to obtain them, have been compared with the X-ray results.

Determination of lead in Santowax: This determination illustrated the low limit of detection which was attainable by X-ray spectrography in a favourable case. Santowax was an inert synthetic wax composed of very light elements and therefore was very transparent to X-rays. Optical spectrographic examination of the ash of 70 g. gave a result which was much smaller than anticipated—less than 1 p.p.m. An X-ray examination was made but no evidence of the presence of lead could be found, whereas it was readily detected in a sample to which 0.8 p.p.m. lead had been added. Thus the optical spectrographic result was confirmed by a direct non-destructive analysis of the sample.

Discussion

In reply to a question on the cost of the X-ray spectroscope, Mr. Shalgosky said that the US instrument cost about £5,000 without import duty.

Dr. Milner pointed out that strontium radioactivation only had an accuracy of $\pm$ 5 per cent.

Dr. J. Hallam remarked that on listening to the lecture he had discovered that the calibrations were all chemical analyses. Mr. Shalgosky agreed. He instanced work carried out at the outstation at Chatham on yttrium in monazite sand. Consistent results were not obtained as some of the yttrium had vanished. In two hours, using the X-ray spectroscope, his station had repeated the work and they could guarantee the result. He pointed out, however, that X-ray analysis was only a surface one—it was not for mass analysis.

Asked about the use of the disc containing the material, Mr. Shalgosky said corn starch could be used as diluent. A sample of 1 mg. had been analysed with a curved crystal spectrograph. Efficiency of counting was likely to be less with small samples, therefore a photographic recorder might have to be used. Wavelengths of 3 to 5 angstroms would open up the field.

Asked what part did interference play on the results, Mr. Shalgosky said that manufacturers provided tables which compared length of collimator and blade space. The length of crystal and the whole technique was similar to optical spectroscopy.

Mr. L. E. Brookes asked about interference in spectrographic analysis. In reply, Mr. Shalgosky stated that one knew the number of counts that had to be made.

Another member asked what were the times for strontium analysis. Mr. Shalgosky said 1 min. 6 sec. for the line and 3 min. for the background.

Analysis of 'Ferrites' using EDTA

THE different useful compositions resulting from replacement of the ferrous iron in Fe_3O_4 structure by various other divalent metals were mentioned by D. G. Timms. In a search for rapid methods for the determination of most of the metals used in a range of ferrite compositions, advantage had been taken of the unique properties of EDTA.

Discussion

Dr. J. H. Hamence asked what was the position with regard to aluminium and the ferrites. Did aluminium give rise to difficulties. Mr. Timms said that was indeed so. Aluminium blocked the indicator. A member of the audience suggested that ferrites were highly sintered and extremely insoluble.

Mr. Timms said that the ferrites dissolve in concentrated hydrochloric acid. Any remaining could be taken up by bisulphite fusion.

Asked whether there was any evidence of slowness of the end point with manganese and zinc, Mr. Timms stated that there was. Estimation of manganese was carried out by means of back titration. Where a direct titration was carried out with manganese in cyanide, the end point was 'sluggish'. One had to wait for more manganese to go into solution. There was no trouble with zinc at a pH of 10.5.

Chemical Price Index Rose in August

WHOLESALE price index of chemicals and allied products increased by 1.1 in August above the July index of 142.9, according to the Board of Trade price index. The following are the price movements for a range of chemicals and allied products (30 June, 1949 = 100):

	1956	1957	
	August	July	August
Chemical and allied products	140.1	142.9*	144.0*
Dyes and dyestuffs ...	144.0	143.1	143.1
Disinfectants	126.5	126.5	126.5
Insecticides, weed-killers and fungicides	138.3	131.7	131.7
Synthetic resins and plastics materials ...	123.5	120.9	121.0
General chemicals ...	157.5	162.0	164.2*
Benzole, pure, BS 136/1950	182.9	191.4	191.4
Caustic soda liquor, 100° TW	157.6	163.6	168.6
Soda ash, light d/d	164.5	170.0	174.5
Soda ash, light, f.o.r. works	173.4	181.1†	185.7
Sulphuric acid, BOV	173.7	177.2	177.2
Sulphuric acid, ROV, 94/95 per cent ...	181.8	186.8	190.8
Drugs and pharmaceutical preparations	105.0	105.4*	105.6*
Explosives, private sector	154.0	153.6	153.2
Soaps, candles and glycerine	123.1	126.5†	129.7*
Synthetic detergents	115.4	120.3†	121.1*
Ethyl alcohol, BS 507/1933	156.7	241.1	241.1
UK Imports			
Carbon black ...	127.6	133.4*	133.4*
Fertilisers	194.2	194.1	194.9
Pyrites, c.i.f. UK ports	176.9	172.3	161.8
Sulphur, crude (for acid making), c.i.f. ...	176.6	163.6	163.6

*Provisional †Revised

Factory Planned

The Chemical Supply Co. Ltd., 7 Idol Lane, London EC3, have had plans prepared for the erection of a factory on a site at Abbey Road, Barking, Essex.

CHEMICAL PIONEERS

11 Henry Deacon

Henry Deacon, the subject of this 11th article by Dr. D. W. F. Hardie, was encouraged by Michael Faraday who arranged for his training as an engineer. Deacon, however, made his name as a chemist with the chlorine process which bore his name. The last Deacon convertors in this country closed down as recently as 1929.

HENRY DEACON was born in London on 30 July 1822, the elder son of Henry Deacon, a merchant in modest circumstances, who, in 1821, had married his cousin, Esther Deacon. In the mid-18th century, Deacon's ancestors, who for generations had lived in the Kettering district, migrated to the metropolis. Had Henry Deacon's family not been members of the Sandemanian Church it is unlikely that he would have had a place in the history of chemical industry.

Michael Faraday, who was the most prominent lay-preacher and elder in the London Sandemanian community, became interested in young Deacon. At the age of 14 Henry Deacon was apprenticed to an engineering firm in London. This concern becoming bankrupt, Faraday arranged for Deacon's indentures to be transferred to Nasmyth and Gaskell, Patricroft, near Manchester.

Patricroft Foundry, at the time of Deacon's apprenticeship there, was riding high on a steadily rising tide of mechanical industrialisation. Holbrook Gaskell, the junior partner, conducted the commercial side of the business at Patricroft. As an engineer Deacon could not have had a better training than in the works of the versatile Nasmyth; he retained, however, his interest in chemistry which had been awakened by his attendance at Faraday's lectures.

It may be supposed that it was as a result of Nasmyth and Gaskell supplying glass-polishing machinery to the St. Helens firm of Pilkington that Henry Deacon made his first contact with the glass industry. He took up employment with Pilkingtons in St. Helens in 1841. As manager of the glass-polishing department of that firm Deacon, in 1851, was in receipt of a wage of £7 a week, and was the concern's highest paid employee.

In that same year, 1851, Deacon to outward appearance suddenly severed his connection with Pilkingtons and departed to nearby Widnes. Although some obscurity surrounds the events, there is sufficient evidence to indicate that Pilkingtons were at that time considering entering the alkali-making industry in order to secure cheaper supplies of soda for their glass manufacture. It was natural that they should send their chemically-minded engineer, Henry Deacon, to Widnes to explore the possibilities of the ammonia-soda process with the assistance of William Gossage, who was then experimenting with that method at Widnes.

On 1 October 1853 William Pilkington, a partner in the glass manufacturing firm, and Henry Deacon took a 1,000-year lease of a 5-acre site at Widnes. Before their plant could be brought into operation, however, relations between Deacon and his partner were approaching breaking-point. Deacon, in the meantime, had been in touch with his former employer of Patricroft days, Holbrook Gaskell. Gaskell, after a 15-year association with Nasmyth, had retired from Patricroft in 1850.

Matters between Pilkington and Deacon soon reached such a degree of unpleasantness that they communicated with one another only through a third party. In Deacon's view Pilkington had failed to push ahead the supply of essential items of plant. 'I have hitherto found it quite impossible to please him,' wrote Pilkington to his solicitor, '. . . I cannot tell or express to you how much pleased and relieved I shall be

Henry Deacon

to get rid of such an unamiable, selfish and arrogant fellow as he is'. In fairness to Deacon it should be said that his part of the surviving correspondence does not appear to justify his partner's bitterness. In June 1855 the Deacon-Pilkington partnership was dissolved and a new one formed between Deacon and Holbrook Gaskell. The deed of dissolution contained the condition that, if the ammonia-soda ultimately produced proved suitable for glass-making, the Pilkingtons were to be supplied with such quantities as should from time to time be agreed; thus the object of the first partnership was in part preserved.

About 1867, in his works laboratory at Widnes, Henry Deacon began experiments with a view to working out a process for producing chlorine by air oxidation of the byproduct hydrochloric acid from his salt-cake pots. It is reasonably certain that, at the outset, he had hoped to use manganese dioxide as the catalyst for his gas-phase reaction. Failing in this, he turned to the use of copper salts.

The problem that had to be solved was that of catalysing the reaction of a large flow of mixed gases at a constant temperature sufficiently low to favour liberation of chlorine in economic quantity. It is more than doubtful whether Deacon could by himself have evolved the chlorine process which bore his name. The final successful form of the process was the result of a decade of painstaking research mainly carried out by his chief chemist, Ferdinand Hurter, a pupil of R. W. Bunsen.

As an important and essential part of the old Leblanc system of chemical manufacture the Deacon chlorine process only came into use after its inventor's death. The gas from the Deacon converters contained at most 9 per cent chlorine, in admixture with partly deoxygenated air and steam. The dilute nature of the converter gas necessitated development of a new type of bleaching powder chamber in which the absorbing lime was exposed in extensive, very shallow layers. The contemporary rapid success of Weldon's intrinsically simpler chlorine process, which gave a gas of 85-90 per cent strength, undoubtedly discouraged initial interest of manufacturers in Deacon's. Potentially, however, Deacon's process offered the prospect of recovering most of the chlorine originally present in the salt fed to the saltcake pots, whereas Weldon's process could recover only half of that chlorine.

Deacon's process has the great techno-historical interest that it was the first gaseous equilibrium reaction to be operated on an industrial scale and the first important chemical process to be developed by physical-chemical research in the modern sense. The last Deacon converters in this country were shut down as recently as 1929. Today, particularly in the United States, byproduct acid from organic chlorinations has raised again the problem which faced the Leblanc manufacturers in the form of great quantities of byproduct hydrochloric acid from their saltcake pots. Various modernised forms of Deacon's process, using oxygen instead of air, have been evolved in order to recover chlorine from byproduct acid and thus to avoid the overproduction of caustic soda which would result from increased manufacture of electrolytic chlorine.

Henry Deacon, engineer turned chemist, invented besides his chlorine process the so-called 'plus-pressure' saltcake furnace, which was widely used in the 19th century heavy chemical factories. He never lost interest in the ammonia-soda process which had engaged him at the outset of his industrial chemical career. In 1872 he told Ludwig Mond of ammonia-soda developments on the Continent. 'Mr. Deacon,' Mond wrote to Henroz, 'has told me that you spoke to him about the rapid development in Belgium of the manufacture of soda salts by the ammonia process. You will understand that this process, which produces no waste, is very disturbing to me. . . .' Disturbing it certainly was, since Mond was preparing at that time to establish a works in Widnes to recover sulphur from Leblanc alkali waste. Deacon's communication to him suddenly and drastically altered Mond's plans and also the then course of chemical industry in England.

Deacon cannot properly be described as a great chemist or even as a very notable inventor; he had, however, qualities of personality which made for success in technical enterprise. In the course of 25 strenuous years he amassed a fortune of over £100,000. Before his 50th year Deacon's health was seriously impaired by overwork; he became totally bald, an affliction which he concealed by wearing a wig. When in the summer of 1876 he contracted typhoid fever his exhausted constitution could offer no effective resistance; he died on 23 July after a week's illness.

Overseas News

TWO NEW CHEMICAL COMPANIES FORMED IN PORTUGAL

TWO new companies have been set up in Portugal to enlarge the scope of the Portuguese chemical industry. Sociedade Portuguesa de Petroquimica SARL, Rua do Alecrim 57, Lisbon, is to treat products and sub-products of the SACOR petroleum refinery to produce ammonia and gas for domestic heating.

Also at 57 Rua do Alecrim, Nitratos de Portugal SARL is to produce, distribute and sell nitrogenous and ammoniacal fertilisers.

The Minister of Economy said that it was intended to invest about 400 million escudos (£5 million) in these two companies which aimed, apart from supplying Lisbon with its domestic gas, at producing 36,000 tons of ammonia annually, corresponding to 136,000 tons of nitrogenous fertilisers, valued at 230 million escudos (£2¾ million).

Total investment in the nitrogenous fertiliser industry would amount to 1,100 million escudos (£13.8 million) when these new enterprises were established. Production would amount to 229,000 tons annually, valued at 400 million escudos (£5 million). Existing factories, which in 1956 produced 114.5 million tons of nitrogenous fertilisers, would be authorised to increase their productive capacity.

Provisional estimates of fertiliser consumption during the agricultural year 1956-57 were: nitrogenous, 276,308 tons; phosphatic, 388,421 tons; potassic, 14,454 tons; and compost, 5,632 tons.

Prices, which are Government subsidised, have been reduced by 60 to 100 escudos a ton. Subsidisation of calcium additives, of which 40,000 tons were sold during the past year, will also continue.

Threatened Closure of Sicilian Sulphur Mines

Should the Italian Government authorise Italian artificial fibre manufacturers to import some 35,000 tons of sulphur from the US under the temporary imports systems, all Sicilian sulphur mines are stated to have said they will close. Reason for the artificial fibre manufacturers' wish to import US sulphur is that Sicilian sulphur costs more than twice the imported product. Present unsold stocks of Italian sulphur are said to total 300,000 tons.

ICI (Australia) to Increase Soda Ash Production

Projects are being developed by Imperial Chemical Industries of Australia and New Zealand to increase production of soda ash up to 130,000 tons a year. New concentration areas at the Dry Creek Saltfields in South Australia are now complete and the plant Osborne is scheduled to be ready to handle the increased production by August of next year.

The concentration areas at Dry Creek have been increased by 700 acres and have been flooded with sea-water. Work is reported to be well advanced on the new crystalliser area an d salt should be harvested with new equipment in 1958. New construction at the Osborne alkali works will consist mainly of extensions and alterations to existing plant.

El Salvador May Have Large Fertiliser Plant

President Lemus of El Salvador recently stated that the possibilities of installing a large fertiliser plant were being considered. The scheme would cost about 40 million colones (about £5.8 million) and it was hoped that foreign as well as Salvadorean capital would be attracted. If the project is put in operation production should cover the needs of Central American countries.

Japanese Develop Titanium Refining Process

A new refining process for titanium, said to yield an extremely pure form of the metal, has been developed at Tok Tohoku University, Japan. It is expected to free Japanese firms from the need to employ a US method entailing heavy royalty payments. Patents have been applied for in Japan and abroad, but details of the method have not been disclosed. It is reported to be a simple process using titanium tetrachloride (from iron sand abundant in Japan) in conjunction with gaseous magnesium. A mixture of the two is forced into a vacuum reaction tower at 1,000°C and titanium is yielded through the tower's 'wall reaction'.

New Coke and By-Products Plant at Port Kembla

Work has begun on a new battery of 96 coke ovens together with a byproducts chemical plant at Port Kembla, Australia, for Australian Iron and Steel Ltd., principal subsidiary of the Broken Hill Proprietary Co. Ltd. The project is expected to cost £9 million.

Present coke-making capacity at Port Kembla will be increased by two-thirds to approximately 1,750,000 tons a year, requiring 2,800,000 tons of coal. Each 24 hours the new unit will produce 1,920 tons of blast furnace coke, 31 million cu. ft. of coke oven gas, 14,000 gallons of tar, 23 tons of ammonium sulphate and 6,000 gallons of light oil which will provide benzol, toluol, solvent naphtha and other chemicals.

Chemicals and Pharmaceuticals in Peru

Imports of chemicals and pharmaceutical products into Peru in 1955 totalled £7 million. Of this, exports from the UK equalled about £650,000, from Germany £900,000, from the US £4,400,000, and from Switzerland £350,000. About £3,160,000 of the £7 million total was for the import of pharmaceuticals.

The importing of pharmaceuticals in bulk, and packing them locally has increased considerably in recent years. Many leading US and European manufacturers have their own establishments in Peru, mainly for bottling and packing imported products. Indigenous drugs produced locally are cocaine, rotentone, quinine, cream of tartar, valerian roots and curare.

Products from the UK are stated to be competitive with other imports, although US manufacturers are considered to spend more money on introducing an article. Local products are usually slightly less in cost than the imported article, and although competition for the British manufacturer is mostly foreign, local competition is increasing. The distributors' or wholesalers' profit is 26 per cent on landed costs, and the retailers' profit is 35 per cent on distributors' price. Terms of payment and credit range from 90 or, more customary, 120 days' sight.

Agricultural Chemical Consumption to Double

Canadian consumption of agricultural chemicals is expected to double in the next six years, the annual meeting of the Canadian Agricultural Chemical Association at Mont Tremblant, Quebec, was told. This statement was made by research manager Mr. D. K. Jackson, of Monsanto (Canada) Ltd., in a panel discussion with Mr. J. J. Parchelo, chief of the metal and chemical products section of the Dominion Bureau of Statistics.

Total sales of agricultural chemicals last year amounted to $24,685,000 compared with $7,200,000 ten years ago. Mr. Jackson attributed the growth in the industry to an increase in use of chemical weedkillers and insecticides.

Vice-chairman Mr. W. W. Buchanan, of the Tariff Board, Ottawa, described how Canada's tariff structure had assisted in the establishment of the country's agricultural chemical industry. All imported items used in the formulation and manufacture of agricultural chemicals were duty free, he said.

Lignin Increases Tyre Life

Experiments by Canadian Government and private research agencies have shown that lignin can be used to give longer life to tyres, particularly the large diameter tyres used in military vehicles, The National Research Council of Canada reports.

At a conference held recently by the rubber division of the Chemical Institute of Canada and the American Chemical Society, a paper describing these experiments was presented by L. H. Krichew, Directorate of Vehicle Development, D. W. MacGregor, Howard Smith Paper Mills Ltd., and T. R. Griffith, head of the rubber chemistry section of NRC's Division of Applied Chemistry, where the tyre tread formulation was developed.

In exhaustive road tests carried out in Texas these tyres, having synthetic rubber treads reinforced with lignin, showed 15 per cent more resistance to wear than conventional tyres.

Sealing Methyl Bromide Leaks

A new US technique for sealing methyl bromide cans that is stated to virtually eliminate the possibility of leaks has been

developed by the Dow Chemical Co. It is being used for sealing Dowfume MC-2, Dow's methyl bromide with chloropicrin as an odorising agent.

The new seal takes the place of a synthetic gasket which deteriorated on extended contact with methyl bromide and was responsible for the delayed leaking after several months in storage. In September, 1955, 960 cans sealed with the new device were shipped to Brazil and then returned to the US. After 23 months in shipment and storage only two cans—which were damaged in shipment—showed any weight loss. The remaining 958 cans were found in perfect condition after almost two years. Millions of cans with the new seal have been moved since without a single customer complaint, it is stated.

Effectiveness of the new seal will permit overseas shipments to be stowed below deck, according to Dr. Smith, technical director of Dow Chemicals, saving shippers considerable expense in freight costs. The new seal also gives methyl bromide a shelf life of several years and permits advance packing and warehousing in preparation for prompt shipment in peak seasons.

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Special information can also be given by Head Wrightson with regard to the pre-reduced methanol catalyst which is stated to have particularly good performance characteristics. Under terms of the company's agreement with Inventa, however, Head Wrightson are unable to release information concerning the production rate per litre of catalyst.

Methanol is produced from synthesis gas which can be produced from coal, coke, oil and natural gas. The source and analysis of the synthesis gas are of great importance in the design of a methanol plant and this applies particularly to the contents of impurities and inerts in the gas.

In the Inventa process synthesis gas is fed to a multistage compressor and compressed to the required pressure. Synthesis pressure on the pure reactants is of the order of 285 atmospheres, whereas the total pressure depends on the level of inert gases. The usual pressure is between 310 and 350 atmospheres. A six-stage compressor therefore normally is used with intermediate coolers and separators after each stage. If the synthesis gas contains iron carbonyl, Fe $(CO)_5$, a catalyst poison, it must be removed by a special trap to be placed after the compressor. The gas then passes to the oil filters where oil and other condensed constituents are separated from the gas.

Heat Exchange

The oil filters are followed by the reactor. The cold synthesis gas passes through a heat exchanger in counter current to the hot reacted gases and flows to the catalyst basket. There, part of the synthesis gas (13 to 14 per cent maximum) reacts to give methanol, with the production of heat. The hot, reacted gases flow through the heat exchanger and leave the reactor.

Then the gas mixture is piped through an atmospheric condenser where the condensable parts are liquefied (methanol, water, high alcohols). The bulk of fluids is piped to the separator where it is separated from the non-reacted gases. If dimethyl ether is to be recovered, it is separated under pressure and liquefied. The non-reacted gasses flow to a recycle pump and then again to the oil traps where they are mixed with the fresh synthesis gas. The recycle pump has to raise pressure in order to surmount the pressure drop of the whole system.

Crude methanol stored in a separator is expanded through a let down valve into a vessel. The bulk of the gases, dissolved in the crude methanol, is separated from the liquid and can be used for other purposes.

A distillation column separates the crude product into the pure methanol, higher alcohols and water.

The catalyst used for the Inventa process is stated to have given proof of good performance and it is considered the best available.

Synthesis Gas Purity

High production is dependent on purity of synthesis gas and pressure in the converter. The normal initial production obtained in the Ems plant by this special catalyst is higher than with other catalysts. Production naturally declines in time, and it is a question of economy when to fill in new catalyst.

Lifetime of the catalyst will be over a year when the synthesis gas is as prescribed, and the plant is properly operated.

Average analysis of the crude methanol shows that the selectivity for the main reaction is very good. Consequently the efficiency is high and consumption of synthesis gas near theoretical.

The catalyst is not sensitive to sulphur compounds. However, as sulphur may cause severe corrosion in the system, the maximum content of sulphur in the synthesis gas has to be specified. Iron carbonyl (Fe $(CO)_5$) is a strong catalyst poison and can be tolerated only in very small amounts.

As the catalyst works at temperatures of 300° to 340°C the amounts of higher alcohols produced and methane formed are low.

During its lifetime the catalyst does not shrink more than 10 per cent. No dust is formed, which could cause clogging of pipes and valves.

Pre-reduction of the catalyst gives additional advantages. Exchange of the catalyst does not cause long shut-downs, since operation can be started immediately after a new filling of the reactor, no further reducing of the catalyst in the reactor being necessary. The main part of volume reduction has taken place by pre-reducing.

The catalyst can be stored in airtight cans up to two years without loss of its good properties. Also it is not sensibly harmed by shut-downs and restartings of the plant. Should the reaction stop due to faulty operation, it can be easily started again by means of the reactor's heating device.

Bulk density of the catalyst varies between 0.95–1.05 kg/lt. of catalyst.

A typical gas, well suited for synthesis gas, should have the following compositions; by volume, on dry basis:

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Methane, nitrogen and argon, less than	1.50	per cent
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Iron carbonyl, less than	3	ppm
Acetylene, less than	3	ppm
Saturated hydrocarbons, max.	0.50	per cent
Other contaminations	none	

The Inventa process for the production of formaldehyde by the oxidation of methanol, requires that the methanol used should be of high purity in order to avoid contamination of the catalyst. The methanol is diluted in demineralised water and flows through a filter and evaporator which is heated by steam. A Root's blower takes air through a filter and an air cleaner. Air is then blown into the evaporator, and the mixture is evaporated and the vapours flow to the reactor. The upper part of the reactor is filled with a layer of catalyst and the oxidation of the methanol takes place at a temperature of about 560°C. The reactor gases then flow through a quench cooler where steam is produced and this steam is used for heating the evaporator. The cooled gases are piped to an absorber where formaldehyde and the rest of the methanol is dissolved in water.

In order to raise the concentration of the formaldehyde in water the solution is recycled to the absorber. From the absorber the formaldehyde solution flows through a cooler to a crude products storage tank. The crude formaldehyde has a formic acid content of about 0.1 per cent by weight and if necessary this crude is pumped to a de-acidifying plant. De-acidifying is done by ion exchange which will reduce the amount of acid to the desired value.

Textile Institute's New Scholarship

A NEW scholarship—the Frank Wright Scholarship—which will allow the recipient the opportunity of further study in the US, is announced by the Textile Institute. Candidates must have been born in the UK and must possess a university degree of sufficient standing to permit of eligibility for attendance at either the Textile Research Institute, Princeton, or at the Massachusetts Institute of Technology.

The recipient of the scholarship, when accepted by the graduate school of Princeton, would become a candidate for the Ph.D. degree in chemistry, chemical engineering or mechanical engineering. The candidate admitted to the Massachusetts Institute of Technology could gain an M.Sc. degree in mechanical engineering and subsequently the Sc.D.

One Killed in Explosion at E. R. Squibb

One employee was killed and several others taken to hospital suffering from shock as a result of an explosion at the works of E. R. Squibb and Sons, Woodend Avenue, Hunts Cross, Liverpool, on 2 October.

Cause of the explosion is not yet known.

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Textile Institute's New Scholarship

A NEW scholarship—the Frank Wright Scholarship—which will allow the recipient the opportunity of further study in the US, is announced by the Textile Institute. Candidates must have been born in the UK and must possess a university degree of sufficient standing to permit of eligibility for attendance at either the Textile Research Institute, Princeton, or at the Massachusetts Institute of Technology.

The recipient of the scholarship, when accepted by the graduate school of Princeton, would become a candidate for the Ph.D. degree in chemistry, chemical engineering or mechanical engineering. The candidate admitted to the Massachusetts Institute of Technology could gain an M.Sc. degree in mechanical engineering and subsequently the Sc.D.

One Killed in Explosion at E. R. Squibb

One employee was killed and several others taken to hospital suffering from shock as a result of an explosion at the works of E. R. Squibb and Sons, Woodend Avenue, Hunts Cross, Liverpool, on 2 October.

Cause of the explosion is not yet known.

Chemist's Bookshelf

STUDENTS' INORGANIC CHEMISTRY

INORGANIC CHEMISTRY. By *E. de Barry Barnett* and *C. L. Wilson*. 2nd Edition. Longmans, Green and Co., London. 1957. Pp. xvi + 588. 35s.

This modern text-book of inorganic chemistry was first published in 1953. The rapid exhaustion of two printings of the earlier edition has encouraged the authors and publishers to bring out a new and somewhat enlarged second edition. Recent activity in modern aspects of inorganic chemistry has led to the complete revision of certain topics discussed in the earlier book and to the enlargement of others. The sections concerned are those dealing with hydrides, metal carbonyls, polyphosphates, the allotropy of sulphur and phosphorus, heterocyclic compounds related to nitrogen sulphide, clathrates and gas hydrates. The chapter on oxygen has been slightly shortened because of the very recent publication of a specialist work on peroxides and per-salts.

In the opening chapters of the book, the text has been expanded slightly by introducing discussion of new matter concerning acid-base and redox equilibria, the potential of electrodes and the application of solvent extraction technique to the separation of metals. The treatment of the latter subject is disappointingly brief in view of the importance of the method in modern inorganic separation and purification procedures and more particularly since most textbooks omit to deal with it. An addendum picks out some more recent developments for special mention.

Not much information is conveyed in this particular section, of course, but it is well referenced and it signposts modern developments in a most appropriate fashion. The literature of inorganic chemistry is surveyed in an appendix—particularly with regard to facilities for obtaining reprints and photostat copies of papers, etc. In this connection it should be pointed out that the Society for Analytical Chemistry is referred to incorrectly as the Society for Public Analysts. The student is appraised of the whereabouts of libraries in the UK in which any journal he wishes to consult is available.

The first edition of this book is now a well-established text for university students and candidates for graduate membership of the Royal Institute of Chemistry. It needs no recommendation from the present reviewer to spread its fame further afield. While the inorganic chemistry itself is admirably dealt with, the chief value of this work probably lies in the excellent account it gives of molecular structure and electronic configuration. There is no doubt that this book is an improvement on the 1st edition, excellent as it was. The price is surprisingly moderate and well-suited to the budgets of those students to whom it must be regarded as well-nigh indispensable.

T. S. WEST

'Thorough Survey' of the Terpenes

THE TERPENES. Volume 4. By *Sir John Simonsen* and *W. C. J. Ross*. Cambridge: The University Press, 1957. Pp. ix + 524. 70s.

This volume deals with the chemistry of the triterpene hydrocarbons, alcohols, hydroxy-aldehydes, ketones and hydroxy-ketones. Its welcome, by workers in this field, will be all the greater since no other complete review of the triterpenes has been attempted for five years.

The authors deserve to be congratulated on such a thorough survey of the massive amount of published literature on this topic. Although some triterpenes have been known for over a century, recent progress in this subject has been so rapid that no book as comprehensive as this can hope to describe developments made just prior to its publication. The text appears to cover the literature till the end of 1954, while such subjects as the constitution of friedlin and onocerin are mentioned as footnotes.

Its encyclopaedic form closely follows that of previous volumes, giving details of the occurrence, isolation, physical constants and a description of the structure determination of each member of the group. It is unfortunate that more space could not be devoted to a discussion of the stereochemistry of each entry and that almost every aspect of this subject should be left to Volume 5.

R. HODGES

Handbook of Plasticisers

PLASTICIZERS. By *D. N. Buttrey*. Cleaver-Hume Press Ltd., London. 2nd edition. 1957. Pp. vii + 213. 35s.

When the first edition of this book was published in 1950 it was the only one devoted to the subject. Other works in the same field have since appeared. Nevertheless, it is claimed that these have not satisfied the continued need for a readily consulted handbook of reasonable dimensions.

The author has left the main body of the book unchanged from the first edition since, he says, basic data remains unchanged. With the rapid growth of the plastics industry the sphere of application of plasticisers has enlarged and for further information the reader is referred to the more detailed literature available from the manufacturers of specific products.

Chapter X, dealing with hydrocarbons and aromatic extenders, has been enlarged. In the first edition, chapter XI dealt with theories on the function of plasticisers. This has been replaced by a chapter devoted to a new class of material, the polymeric plasticiser, often referred to as polyester plasticisers.

A variety of esters and miscellaneous products that have reached commercial production within the last few years are described in chapter XII.

So rapid is development in the plasticiser field that the author regards this edition purely as an interim measure between the 1950 edition and the next edition which will have to be a completely reconstructed work.

It is to be hoped that before this new edition comes out the opportunity will be taken to restyle the book. It would help if physical data such as specific gravity, freezing and boiling points, etc., could be tabulated. The reviewer realises that this would add to the cost of the book; it would, however, add even more to its value as a source of information.

J.P.S.J.

Mathematics for the Non-specialist

MATHEMATICS AND STATISTICS FOR USE IN PHARMACY, BIOLOGY AND CHEMISTRY. By *L. Saunders* and *R. Fleming*. The Pharmaceutical Press, London. 1957. Pp. 252. 27s 6d.

This book offers a short course in mathematics and statistics and is written for the reader who possesses a level of mathematics equivalent to that required for the matriculation examination. Ten chapters of the text are devoted to mathematics and five to statistics. In addition there are eight appendixes containing a great deal of useful data such as fundamental constants, standard integrals, determinants, etc.

The authors have stated that it is impossible to write a book on mathematics in the form of an easy narrative, but their text is something nearly approaching this. It is possible, by careful reading of the text and by calculation of the problems set at

the end of each chapter, to really brush up ones' mathematical knowledge. The concise definition of terms and the well-defined subdivisions within each chapter are of considerable aid to the reader.

The book should prove invaluable to any person who is studying or working in any science and who has not the opportunity of any courses in higher mathematics or statistics. The authors are to be congratulated in the production of a first-class work which fulfils the aims that they set out in the preface.

K. REES

Electrodeposition of Metals

GALVANOTECHNIK. By *J. Billiter*. Springer-Verlag, Vienna. 1957. Pp. viii + 441. 112s 6d. (in German.)

In this second edition of a book dealing with the electrodeposition of metals the original text has been considerably re-written and expanded. A short first section is introductory and deals with electrochemical principles. Brief outlines of such fundamentals as ionic theory, electrode potentials and electrochemical equivalents are given. Discussion of cathode processes includes consideration of current-voltage curves, the electrical double layer, inhibitors, passivity and overpotential.

A rather longer second section is concerned with the formation of cathodic deposits. The influence of such factors as the structure of the cathode and the concentration of cations, the effects of stirring and changes in current density and temperature are briefly but concisely considered. Factors, such as changes in electrolyte composition, mechanical action and inhibitors, which influence the form of the deposit are discussed, typical deposits classified and some general rules given. The origins of faults, leading to the formation of pin-holes or porous deposits, are out-lined.

The remainder of the book, constituting about two-thirds of the text, is concerned with applications and practice. Apparatus, technique and such preliminary treatments of metals as degreasing and the removal of oxide films are first discussed and the deposition of copper, silver, gold, zinc, cadmium, tin, lead, nickel, cobalt, iron, chromium, the platinum metals, tungsten, bismuth, antimony and arsenic (briefly) are then considered specifically.

Conditions for the deposition of each metal from different baths, the composition and analysis of the baths, the effects of additions and variations in composition, the reactions concerned in deposition, the character of the deposits obtained and other aspects are discussed in detail. There is a chapter on coatings from alloys, one on the more important methods of testing metal coatings and a brief account of anodic processes which includes consideration of the Eloxal process and of electropolishing.

The book contains a wealth of detail, both theoretical and practical. There are many tables and diagrams. Clear microphotographs illustrating the structure and thickness of metallic deposits are a feature of the book. It is well documented with references but although some are very recent there are many dated 20 or 30 years ago. There are adequate author and subject indexes. It is well produced but the price may deter many from buying a volume of value to electrochemists generally and to those concerned with electrodeposition and electroplating in particular.

W. R. MOORE

Chemist's Bookshelf

GAS CHROMATOGRAPHIC METHODS

GAS CHROMATOGRAPHY. By *A. I. M. Keulemans*. Edited by *C. G. Verver*. Reinhold Publishing Corporation, New York. Chapman and Hall, London. 1957. Pp. xix + 217. 60s.

The number of books on gas chromatography, although increasing, is still not sufficiently large to require an apology for the appearance of another: indeed, as the author points out in his preface, the methods, particularly of gas-liquid chromatography, are still young. The first account of this intriguing subject was published by Martin and James only in 1952. For this reason alone, a new publication on the subject must be greeted with great interest and some curiosity.

No one will question the competency of the author, Dr. Keulemans, to write such a book. He has been a research chemist in the Koninklijke/Shell-Laboratorium in Amsterdam since 1938 and has been engaged for several years in the development of gas chromographic methods. He was chairman of a section at the recent symposium on gas chromatography held by the Institute of Petroleum in London.

Dr. Keulemans has taken great care in the arrangement of the text. The opening chapter is devoted to a review of the whole field of chromatography and related physical processes. This is a very important step because it does attempt to dispel the confusion that exists concerning the relationship of the various branches of chromatography to one another and to other separation processes. The second chapter describes the normal application of gas-liquid chromatography and chapter three discusses, in detail, the apparatus required.

It is a feature of chromatography generally that excellent results can be obtained in routine analyses with little or no knowledge of the underlying theory. If, however, more specialised problems are to be investigated a knowledge of the fundamentals is important. The author has appreciated this in his arrangement and the first three chapters could be claimed to form a book for the routine analyst in themselves.

In chapters four, five, and six, the basic theory underlying gas liquid chromatography is discussed. The following chapter presents special applications of gas-liquid chromatography and includes the determination of solution parameters, the calculation of the activity coefficient at infinite dilution from symmetric and asymmetric elution curves, heats of solution and the design of columns for different separations. The older form of separation, gas-solid chromatography, is presented in the final chapter. Among others, this section outlines the evolution and principles of gas-solid chromatography and discusses new possibilities of the subject, particularly 'molecular sieves' and the use of 'tailing reducers'.

Three useful appendixes to the book are provided. The first describes the principal

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types of stationary liquids used in gas-liquid chromatography; the second is devoted to a discussion of katharometers and includes a description of the double-channel instrument used by the author; while the third describes a simple device for the removal of uncondensable gases from carbon dioxide.

A list of symbols recommended by a special subcommittee for this purpose during the symposium in London is provided, to which the author adheres in the text.

Over 150 literature references are available for the interested reader, some of them as recent as early 1956.

In a subject which is developing as rapidly as gas chromatography, it becomes very difficult for one to decide what should be included in a book on the subject and what should be omitted. After reading the present volume, however, the reviewer is left with the impression that a very good selection has been made and that the contents have come from the pen of an author who has a very wide and intimate working knowledge of the subject.

For the student and research worker this book will be very valuable. It is strongly recommended.

R. J. MAGEE

Symposium Papers on Chemisorption

CHEMISORPTION. Edited by *W. E. Garner*. Butterworths Scientific Publications, London. Academic Press Inc., New York. 1957. Pp. xii + 277. 50s.

This volume contains a record of the 23 papers which were presented at a symposium on chemisorption held at the University College of North Staffordshire under the auspices of the Chemical Society in July 1956. The symposium was divided into five sections—the first on the theory of chemisorption and the remaining four covering chemisorption on insulators, metals, semiconductors and carbon. The majority of the papers were given by British chemists but there were three contributions from Holland and one each from Belgium and Germany. Most of the papers are of a high standard, as might be expected, since many of the authors are well-known for their researches in this field.

The papers fall into three main categories. Firstly, there are papers in which a certain aspect of the subject is reviewed, e.g. D. A. Dowden's contribution on 'Chemisorption and valency', or J. H. de Boer's on 'The cause of the decrease in the heat of chemisorption on metals'. Secondly, there are papers in which the authors summarise and bring together results mainly from their own published work on a special topic, e.g. J. C. P. Mignolet's contribution on 'The charge transfer in physical films on metals' and E. R. S. Winter's on 'Studies of chemisorption on oxides using ^{18}O'. Finally, there are papers reporting the results of a particular piece of research and, in some cases, these resemble very closely papers already published or about to be published in the normal journals. This type of duplication is almost inevitable when reports of conferences of this kind are published.

Although such duplication is far from desirable, it may be argued that it is not important because of the great convenience of having recent work in a particular field gathered together in a single volume. This volume certainly does fulfil this objective, and a valuable feature is the inclusion of full reports of the discussion which occurred at the meeting. This, together with the papers in the first two categories, constitutes the most compelling reasons for purchasing the volume. It is primarily a work for specialists and it can be recommended to those, both in universities and in industry, especially concerned with adsorption and catalysis.

C. KEMBALL

Market Reports

FAIR DEMAND FOR FERTILISERS

LONDON There have been no outstanding features on the industrial chemicals market during the past week and prices have moved within narrow limits, but the undertone is firm. Deliveries against existing commitments continue to be taken up steadily and new business for home account has been on a satisfactory scale, although buyers are inclined to cover no more than immediate requirements.

Trade in compound fertilisers is fairly active and in the coal-tar products market buying interest for home account is well maintained with quotations unaltered.

MANCHESTER A fair demand for a wide range of heavy chemicals from the Lancashire textile bleaching, dyeing and finishing trades has been reported on the Manchester market during the past week. Most other industrial consumers continue to call for reasonably steady deliveries, though in one or two sections, mainly because of seasonal influences, the movement of supplies tends to contract slightly. Fresh enquiries have been circulating on both home and export accounts. On the whole, there is a fair demand for fertilisers, and a ready outlet is being found for most of the light and heavy tar products.

GLASGOW The level of business in the Scottish heavy chemical market during the earlier part of the past week was fairly steady. Towards the latter end, however, the tendency was to a slightly quieter position. Prices showed little or no change, and for the most part were maintained at recent levels. In regard to the export market, considerable interest is still being shown, and quite a volume of varied enquiries are being received.

Perkin Trustees Announce Three Awards

THREE awards—for graduates, candidates in industry and teachers—are announced by the Perkin Centenary Trust for the academic year 1958–59. They are:

Perkin Centenary Fellowship. Offered for one or two years to a graduate for higher study, has a value of not less than £600 a year, and is tenable, from October 1958, at any university, technical college, or other institution, approved by the trustees. Application forms are available from the secretary, care of the Chemical Society, Burlington House, London W1.

Perkin Centenary Scholarship. Two awards are offered, each for two years starting in October 1958 and renewable at the discretion of the trustees for a further year, to enable candidates employed in an industrial firm or other institution concerned with the manufacture or the application of colouring matters to receive an education at a university or technical college. Each award will have a value of £300 a year. There is no means test, and a successful candidate is not debarred from receiving the whole or a part of his normal salary from his employers during his tenure of the scholarship.

Perkin Exchange Lectureships. An appointment will be made from time to time by the trustees to enable a senior teacher at any appropriate university, or technical college, or other institution, to visit some similar establishment overseas to deliver a short course of lectures. In return, a visit to a British institution by some overseas scientist will be arranged. A second appointment contemplated will permit the exchange of lecturers for a period of up to one year between comparable institutions in Britain and overseas.

Company Fined for River Pollution

AT Skipton, York., Magistrates' Court, on 2 October, Dales Chemicals Ltd., Boroughgate, Otley, York., were fined the maximum of £50, with 10 guineas costs, for causing liquid poisonous to fish to flow into Hebden Beck on Grassington Moors. It was alleged that over 5,000 adult trout, valued at £4,000, and the whole of the trout fry in the Beck, were killed as a result of the water pollution, which was described by Mr. D. C. North, prosecuting on behalf of the Yorkshire Ouse River Board, as one of the most serious cases of fish mortality in the Board's experience.

The company was formed to extract barium and fluorine compounds from the old lead mine spoils heaps on the moor. The operation is carried out in ponds, the idea being to settle the heavier particles in the ponds, separate, and rewash them. On 17 April, one of the ponds breached and thousands of gallons of toxic liquid poured down the moors into Hebden Beck.

Mr. P. H. C. Walker, Otley, for the firm who pleaded 'Not Guilty', submitted that there was no case to answer. It was necessary, he said, to show that the company through the acts of a responsible servant knew of the breach and did nothing to remedy it. At the time of the accident the mill superintendent had taken what seemed to him all reasonable precautions.

PEOPLE in the news

● MR. J. DAVIDSON PRATT, C.B.E., M.A., director of the British Road Tar Association and until recently director and secretary of the Association of British Chemical Manufacturers and PROFESSOR F. A. VICK, O.B.E., PH.D., F.INST.P., department of physics, University College of North Staffordshire, succeed PROFESSOR E. G. Cox, F.R.S., department of inorganic and structural chemistry, Leeds University and DR. P. DUNSHEATH, C.B.E., formerly of W. T. Henley's Telegraph Works Co. Ltd., the two official visitors to the British Cotton Industry Research Association since 1950, who have retired.

● MR. GEORGE MARLING has joined the trade sales department of the chemicals division of Newton Chambers and Co. Ltd., Thorncliffe, near Sheffield, as representative in the West London area.

● DR. E. B. EVANS of Esso Research Ltd. has been awarded the Eastlake Medal of the Institute of Petroleum for outstanding services. He is a vice-president of the Institute and honorary editor of its publications and has had 30 years service with the Esso Group.

● MR. GEORGE F. FLATOW, DIPL.ING., A.M.I.MECH.E., A.F.INST.PET., has been appointed to the board of Amber Oils Ltd. He was previously technical director. A graduate of the universities of Charlottenburg and Stuttgart, he came to England in 1939, when he joined Amber Oils on the specialised oils side.

● SIR GEORGE BEHARRELL has resigned from the presidency and from the board of the Dunlop Rubber Co. LORD BAILLIEU has resigned from the chairmanship of the company but he will continue as a director and has been appointed president. The new chairman is MR. G. E. BEHARRELL, former deputy chairman and managing director. He will continue to act as chief executive of the company. MR. JOHN H. LORD and MR. R. M. GEDDES have been appointed managing directors and MR. T. E. PEPPERCORN becomes an executive member of the board.

G. E. Beharrell

● DR. R. S. TIPSON, an English-born authority in the fields of carbohydrate chemistry and the organic synthesis of potential antiviral, antitumor, and antimalarial agents, has joined the organic chemistry section of the US National Bureau of Standards. He will be engaged in the study of mechanisms of organic reactions, and the stereomeric factors affecting the course of the reactions. This work will broaden the Bureau's research programme in organic chemistry and provide basic knowledge in an area of increasing significance. It extends and supplements an active fundamental study of labelled carbohydrates. Born in Derbyshire in 1906, Dr. Tipson gained his B.Sc., Ph.D. and D.Sc. at Birmingham University. He went to Canada in 1929 as a fellow in the department of industrial and cellulose chemistry at McGill University. From 1930 to 1939, Dr. Tipson served on the staff of the Rockefeller Institute for Medical Research in New York City, investigating nucleic acids, sugars, and plant gums.

● Expanding interests of the British Aluminium Co. Ltd., London SW1, have made it essential to appoint additional executive directors. To facilitate this MR. W. H. HARRISON and MR. E. HOLLAND-MARTIN have relinquished their directorships as from 30 September. Newly appointed to the board are MR. G. A. ANDERSON, director and general sales manager, and MR. W. B. C. PERRYCOSTE, MR. J. SALTER, directors and general production managers. MR. G. W. LACEY, director in charge of sales, has assumed the title of commercial director.

● MR. JAMES CURTIS, formerly executive vice-president of the Lummus Co., has been appointed president of its affiliated company in New York, the Chemical Construction Corporation, whose London associates are Chemical Construction (Great Britain) Ltd. On the take-over of Chemical Construction Corporation by the Electric Bond and Share Co. from the American Cyanamid Co., MR. C. A. HARWICK, who had been on the point of retiring, was asked to become vice-president, undertaking the duties of president, until such time as a more permanent appointment could be made. Mr. Harwick is still with the corporation.

● SIR HAROLD SMITH, chairman of the Gas Council, was installed on 3 October as the first hon. president of the newly formed Houldsworth Society at Leeds University. The Society commemorates the late Sir Hubert Houldsworth, chairman of the National Coal Board until his death in February 1956, who was a student and member of the staff of the coal, gas and fuel department of Leeds University and Pro-Chancellor for six years. In recent years the department of coal, gas and fuel has expanded and outgrown its title. Two new departments, chemical engineering and metallurgy have been opened and the parent department renamed the department of gas engineering, general fuel science and ceramics. These three departments now form the Houldsworth School of Applied Science whose 200 students will move into their new £610,000 building in May next year.

● New appointments made by Birmingham University include the following: G. V. JEFFREYS and D. R. OLIVER, PH.D.(BIRM.), to be lecturers in chemical engineering; A. P. BATSON, PH.D.(BIRM.), N. E. BOOTH, M.A.(QUEEN'S, ONT.) and J. D. HOBSON, PH.D.(SHEF.), to be ICI research fellows; B. SHAW, PH.D.(LOND.), to be lecturer in medical biochemistry and pharmacology.

● MR. H. C. EXELL, who has been elected president of the Purchasing Officers Association for 1957–58, is controller of stores at the North Thames Gas Board. He is a member of the Gas Council standards committee and a representative of the Gas Council on the BSI gas industry standards committee. Mr. Exell left Leeds Grammar School to go to King's College, London where he gained B.Sc. (Hons. Chemistry) and M.Sc.in fuel chemistry. He entered the gas industry in 1923 as an assistant in the laboratory at the Stratford Works of the Gas Light and Coke Company. Two years later he transferred to the research department. He became controller of stores in 1947.

H. C. Exell

Other new officers of the association are: executive vice-president, C. F. HUEBNER (British Oxygen Co. Ltd.); vice-presidents, I. FAULKNER (L. H. Newton and Co. Ltd.); J. M. GRAMMER (National Coal Board); F. KAY (Forrestal Land, Timber and Railways Co. Ltd.); J. MCCALLUM (Mavor and Coulson Ltd.); J. M. PARKES (Kayser Ellison Ltd.).

● MR. J. M. LALL, an Indian aged 44, has been appointed managing director of Imperial Chemical Industries (India) Private Ltd. He took up his duties on 1 October and will succeed Mr. N. D. Harris as chairman on 1 April 1958, when Mr. Harris retires.

● Directors of Rosite Ltd., Swindon, a new subsidiary of the Plessey Co. Ltd., formed to produce cold moulded plastics under agreement with Rostone Corporation, Lafayette, US, are: MR. A. G. CLARK, chairman, MR. A. E. UNDERWOOD, MR. F. BEACROFT and MR. P. W. JONES (US).

● DR. E. R. COLLINS, of the UK Atomic Energy Research Establishment, Harwell, has been appointed associate professor of physics at Auckland University College, New Zealand.

Commercial News

Monckton Coke and Chemical Plan Plant Modernisation Scheme

AT the 56th annual general meeting of The Monckton Coke and Chemical Co. Ltd., the chairman, Mr. F. E. Holroyd, prefaced his remarks by saying that companies forming part of the Ocean Wilsons (Holdings) Group had been adding to their investment in the company and now held over 50 per cent of the issue share capital of the company. As a consequence several directors of Ocean Wilsons had been elected to the board.

Trading profit for the year including interest received amounted to £201,970 as compared with £167,874 in the previous year. After deducting depreciation £41,245 (£38,381) and taxation £88,862 (£69,105) the net profit for the year is £71,863 (£64,341).

A final dividend of 1s 4d per share has been recommended, making a total dividend for the year of 2s per share. Payment of 2s per share from the surplus arising from realisations of capital assets has also been recommended. This payment will suffer no tax deduction or be liable to surtax.

Capital commitments at 30 June last amount to £100,000 of which £50,000 was required to complete improvements in the company's coal handling plant and the installation of a new sulphate of ammonia plant.

The company is committed to an expenditure of £50,000 for modifications and improvements to plant. It is anticipated that some two years may elapse before the necessary plant is in operation. It is considered that these improvements will lead to an appreciable increase in revenue.

Lawes Chemical Co.

Although accounts for Lawes Chemical Co. showed a slightly reduced profit, a satisfactory year's trading was reported by Mr. F. A. Perkins at the 85th annual general meeting. The exceptional weather during last spring affected sales of fertilisers to some extent. There are indications, the chairman stated, that optimum fertiliser consumption in this country has not yet been reached. With this end in view, therefore, the company has increased its productive capacity and improved storage and handling facilities. A satisfactory start has been made with the new season's trade.

Although nitrogen costs have increased, the company intends to absorb this rise and has not, in fact, raised its ex-works prices of compound fertilisers. A small addition to delivered prices, due to transport costs, is all that is being passed on to customers.

Dunlop Rubber Co. Ltd.

Recovery of the trading position of Dunlop Rubber Co. Ltd. in the UK in the latter half of 1956 has been maintained during the first six months of this year. This is stated in the 1957 half-yearly report. Compared with the group trading results for the previous two half-year periods sales, January to June, 1957, were £152 million, with group profit £5.73 million (£165 million, July to December, 1956, with group profit £5.74 million; £147 million, January to June, 1956, with group profit £2.28 million).

Fluctuations in raw material prices, particularly rubber, have been much less severe than in the first half of 1956, but costs are being adversely affected by increases in wages, operating expenses and financing charges. Further progress has been noted in earnings overseas, it is stated. This applies to exports from the UK and to subsidiary companies abroad.

Glaxo Laboratories Ltd.

After all charges including £2,332,000 (£1,441,000) for tax, group net profit for Glaxo Laboratories Ltd. has increased from £1,665,000 to £1,838,000 in the year ended 30 June, 1957. Group profits include £88,000 (£16,000) relating to previous years. There is £26,000 (£25,000) attributable to outside interests. For capital reserve—obsolescence and replacement, £1 million has been set aside.

The company is raising the dividend from the equivalent of 9½ per cent to 12½ per cent, with a 7½ per cent final for the year.

Greeff Chemical Holdings

An interim dividend of 5 per cent (same) is announced by Greeff Chemical Holdings. Total dividend paid during the previous year was 16 per cent.

NEW COMPANIES

BORAX (ARGENTINA) LTD. Cap. £10,000. To carry on in Argentina or elsewhere the business of miners, refiners, distillers, manufacturers of and dealers in any ore, mineral substance or product, and any chemical or other preparation, etc.

ALDERSON CHEMICALS LTD. Cap. £2,000. Manufacturers of and dealers in glues, glue stocks, gums, pastes, resins, adhesives, plastics, etc. Directors: C. A. Smith, B. M. A. Smith. Reg. office: High Street, Braunston, nr. Rugby.

H. S. B. LABORATORIES LTD. Capital £100. Scientific, chemical and industrial researches and investigations, etc. Directors: Henry S. Holt, Alfred J. Felton and Helen Keane.

P. WISHINGSKY (SUPPLIERS) LTD. Cap £100. Manufacturers of and dealers in chemicals, gases, drugs, medicines, etc. Directors P. and F. Wishingsky. Reg. office: 13/14 New Bond Street, London W1.

Chemical Stocks & Shares

British Xylonite Prospects

MARKETS over the last two weeks have remained in their same depressed mood, but towards the end industrial shares were inclined to rally a little, helped by the strong sterling position. Chemical shares have shown no really marked change apart from Glaxo Laboratories advancing 9d to 34s 1½d on the increased dividend and good results.

Borax 5s deferred have fluctuated around 22s. Imperial Chemical Industries Ltd after touching 41s 3d at one point, on the half-yearly statement later sagged to 39s 6d. Other uncertain spots were Albright and Wilson, down 1s 6d to a fresh low of 17s 6d. F. W. Berk, on the acquisition of Leda Chemicals and Lea Valley Chemicals, were virtually unchanged at 5s 1½d.

Interest has been shown in the announcement last week by John Summers and Sons of their new material Stelvetite (see p. 590).

Close collaboration of a subsidiary of British Xylonite Co., BX Plastics, with John Summers brings to light the potential regarding plastics applications of the new material. Obviously, time must elapse before this begins to be reflected in the results of the parent company but, taking a longer view, there certainly seems to be considerable promise for the future.

British Xylonite, with its several subsidiaries covering a very much wider field of products in polythene containers and similar flexible packs, food and pharmaceutical trades, is also associated with Ilford in the manufacture of film base, and stands to be a very worthwhile holding. For 1956 the dividend was 11 per cent paid from group earnings of 21.9 per cent and at 30s the £1 Ordinary units are yielding 7.3 per cent.

1957 High	1957 Low		8 Oct.	Change on last two weeks
23/7½	17/6	Albright & W. 5/-	17/6	—9d
11/6	10/6	Anchor 5/-	10/9	+3d
1/3	1/-	Ashe 1/-	1/3	+1½d
24/6	20/-	Bakelite 10/-	22/1½	+1½d
7/10½	5/-	Berk 5/-	5/1½	+1½d
36/-	22/-	Borax 5/- Dfd.	22/-	—6d
10/9	9/-	Bt. Chrome 5/-	9/9	—3d
13/10½	10/3	Bt. Glues 5/-	10/10½	—2½d
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11/9	9/-	Yorkshire Dye 5/-	10/3	—9d

FOR YOUR DIARY

MONDAY, 14 OCTOBER

Royal Institute of Chemistry—Ewell: County Technical College, Reigate Road. 6.30 p.m. 'Chemical problems in the brewing industry' by A. H. Cook.

SCI Chemical Engineering Group—London: The Connaught Rooms, Great Queen Street, WC2. 6.45 p.m. Extraordinary general meeting.

SCI Chemical Engineering Group—London: Royal Institution, Albemarle Street, W1. Symposium on 'Safety in chemical industry'. Till 15 October.

TUESDAY, 15 OCTOBER

Institution of Chemical Engineers—Manchester: College of Science and Technology. 6.30 p.m. 'Some problems in the large-scale liquefaction of hydrogen' by W. L. Seddon.

Plastics Institute—London: Wellcome Building, 183-193 Euston Road, NW1. 6.30 p.m. 'New developments in the manufacture of phenolic moulding powders' by E. Schneider and D. H. M. Brooks.

SCI Agricultural Group—London: 14 Belgrave Square, SW1. 10.30 a.m. 'Soil properties and soil retention' by E. G. Williams, 'Measurement of fertiliser phosphorus uptake and radiation damage using radio-phosphorus' by E. R. Armitage, 'Organic acids produced in farmyard manure and their influence on the solubility of soil phosphate' by G. W Cooke and 'Applications of soil conditioners in soil research' by D. Gunary and S. Larsen.

WEDNESDAY, 16 OCTOBER

British Coal Utilisation Research Association—London: Institution of Civil Engineers, Great George Street, SW1. 5.30 p.m. 6th coal science lecture 'From coal to coke' by M. Raymond Cheradame.

Royal Institute of Chemistry—London: King's College, Strand, WC2. 6 p.m. 'Solvent extraction in inorganic chemistry' by H. M. N. H. Irving.

THURSDAY, 17 OCTOBER

SCI Road and Building Materials Group—London: 14 Belgrave Square, SW1. 6 p.m. 'Silicones and the treatment of road and building materials' by J. S. Hughes and P. A. Griffin.

TRADE NOTES

Winston Electronics, Ltd., Shepperton, Middx, have been appointed sole UK agents for a number of industrial electronic control instruments manufactured by Beckman Instruments, GmbH, Munich, and Beckman Instruments, Inc., Fullerton, California, US.

Change of Address

Griffin and George Ltd., laboratory furnishers, state that the address of their sales office and warehouse for the Birmingham Area is now Frederick Street, Birmingham 1 (Central 2552).

The telephone number of their Edinburgh office at Johnston Terrace is now Caledonian 4868.

Cold Moulded Plastics

Plessey Co. Ltd. have formed a new subsidiary, Rosite Ltd., to produce at Swindon cold moulded plastics for the electrical industry, under agreement with Rostone Corporation, Lafayette, US. Chemically, Rosite is a calcium aluminosilicate with a microscopic grain structure, integrally reinforced with asbestos fibre. An inorganic plastics, having arc-resistance non-tracking characteristics, Rosite is said to have stone-like qualities. Production to US standards will start shortly.

Russians Order from Towers

Automatic distillation apparatus was inspected by Mr. Verovyov, a member of a Russian trades delegation, when he visited the works of J. W. Towers and Co. Ltd., Victoria House, Widnes, recently. The firm has received a substantial order from the Soviet Union. It is expected that the apparatus will be used in the Moscow petroleum refineries.

High Vacuum Furnace

A high vacuum metallurgical furnace opened by G. L. Willan Ltd., Sheffield, this week, is stated to be the first of its kind in the country. The plant consists of a high-frequency generator with furnace and pumps, to melt metal for the production of alloys and stainless steels, particularly for atomic energy plants and aircraft. Noteworthy features claimed for the plant are that the metals will be free from gas and that ingots of 56 lb. can be melted and cast in the plant. Cost of the plant was about £20,000.

Staff Reductions

Staff reductions, which include many scientists and research workers, have been made by British Celanese Ltd. The reductions are said to be due to a trade recession in British exports of rayon fabric. 'Trade in rayon continuous filament yarns has not showed the improvement usually expected in the autumn' the company states.

NEW PATENTS

By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents),' which is available from the Patent Office (Sale Branch), 25 Southampton Buildings, Chancery Lane, London WC2, price 3s 3d including postage; annual subscription £8.

Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

ACCEPTANCES

Open to public inspection 13 November

Arylisothioureas. Farbenfabriken Bayer AG. **786 318**

Ergot alkaloid derivatives. Sandoz, Ltd. **786 138**

Purification of concentrated solutions of salts. Dow Chemical Co. **786 139**

N, N¹-diguanidino diimides of quinone-diolefin adducts. Farbenfabriken Bayer AG. **786 141**

Process for the production of furfural. Soc. Du Glucol. **786 321**

Pest control agent. Farbenfabriken Bayer AG. **786 322**

Organosilicon compounds. Midland Silicones, Ltd. [Addition to 766 528.] **786 142**

Synthetic surface active preparations. Naamlooze Vennootschap W. A. Scholten's Chemische Fabrieken. **786 252**

Thiamine salts. Farbenfabriken Bayer AG. **786 143**

Thermoplastic compositions having improved light stability. Dow Chemical Co. **786 144**

Optically active isomers of threo-β-(p-nitro-phenyl)-serine-methylester. Chinoin Gyogyszer Es Vegyeszetj Termekek Gyara R, T. **786 145**

Method and apparatus for heating gas or air to very high temperatures. Administration Sequestre Des Röchling'sche Eisen- Und Stahlwerke Ges. **786 254**

Aqueous polymer dispersions. Dow Chemical Co. **786 146**

Insoluble resinous copolymers of (chloromethyl) styrene and polyvinyl aromatic hydrocarbons and nitrogen-containing derivatives of the copolymers. Dow Chemical Co. **786 148**

Improving the purity of impure isopropyl alcohol. Esso Research & Engineering Co. **786 256**

Organosilicon compounds. Midland Silicones, Ltd. **786 259**

Recovery of vitamin B_{12}. Richter Gedeon Vegyeszeti Gyar R. T. **786 150**

Improvement of polyester fibres. Farbwerke Hoechst AG. **786 153**

Chemical nickel plating bath and process. General American Transportation Corp. [Divided out of 785 694.] **786 175**

Treating fusible material. Western Electric Co., Inc. [Divided out of 786 170.] **786 171**

Morphine derivatives. Merck & Co., Inc. [Divided out of 786 156.] **786 157**

Open to public inspection on 20 November

Gas pump. Brown, H. S., and Hubble, H. H. **786 558**

Electrodeposition of iron-zinc alloys. British Iron & Steel Research Association. [Cognate application 25306.] **786 418**

Luminescent materials. Mullard Radio Valve Co., Ltd. **786 631**

Fatty acid compositions from marine oil or from fatty acid mixtures obtained therefrom. Universal Oil Co., Ltd. **786 373**

Oxidising anthracene to anthraquinone. Ciba Ltd. **786 374**

Production of shortening. Unilever, Ltd. **786 488**

Manufacture of terephthalic acid. Imperial Chemical Industries, Ltd. **786 561**

Active substance aldosterone and process for isolating it from suprarenal glands. Reichstein, T. **786 562**

Production of combustible gas. Woodall-Duckham Construction Co., Ltd. **786 490**

Production of insulin with increased zinc content. Roskilde Medical Co., Ltd., R. M. C. **786 635**

Method of and furnace for the roasting of sulphide ores. Krebs & Cie. **786 375**

Concentration of suspensions of sand and like materials. Floatex Separations, Ltd. **786 639**

Process of deagglomerating dried agglomerated microspheriodal gel catalyst particles. Grace & Co., W. R. **786 499**

Metallisable heterocyclic azo dyestuffs. Imperial Chemical Industries, Ltd. **786 567**

Production of compressed pellets or tablets from finely divided solid materials. Imperial Chemical Industries, Ltd. **786 502**

Nodules of cement raw material. Smidth & Co. Aktieselskab, F. L. **786 504**

Treatment of hydrocarbon-containing mixtures with aqueous media. British Petroleum Co., Ltd., and Hunter, R. **786 430**

Process for producing combustible gases. Esso Research & Engineering Co. **786 506**

Purification of water. Adamson, R. B. **786 647**

Filter for liquids. Paterson Engineering Co., Ltd., and Baily, E. W. **786 570**

Waxes containing oxygen. South African Coal, Oil & Gas Corp., Ltd. **786 654**

Organosilicon polymers and compositions containing same. Midland Silicones, Ltd. **786 434**

Removal of vanadium and/or sodium from petroleum hydrocarbons. British Petroleum Co., Ltd., Northcott, R. P., and Lester, R. **786 435**

Anti-corrosion compositions. Winn & Coales, Ltd., and Coales, F. B. **786 438**

Method of recovering proteins of bacterial origin. American Home Products Corporation. **786 376**

Carbonisation of coal and like materials in vertical retorts. North Western Gas Board. **786 660**

Consumable electrodes for arc melting chemically reactive metals. Rem-Cru Titanium, Inc. **786 525**

Glass compositions. British Thomson-Houston Co., Ltd. **786 582**

Waterproofing of textile fabrics, and titanic and zirconic acid esters and compositions thereof. Dickinson, Ltd., A. J. **786 444**

Fungicidal preparations containing a basic copper salt. Fisons Pest Control, Ltd. [Addition to 741 620.] **786 380**

Copperable disazo dyestuffs of the triazine series. Sandoz, Ltd. **786 663**

Polymeric materials. Soc. d'Electro-Chimie, d'Electro-Metallurgie et des Acieries Electriques d'Ugine. **786 381**

Iridescent flake and material. Rainbo-cel, Inc. **786 667**

Benzene hexachloride. Columbia-Southern Chemical Corp. **786 583**

Manufacture of benzene carboxylic acids. Bergwerksverband Zur Verwertung Von Schutzrechten Der Kohlentechnik Ges. **786 382**

Production of polyalkyl benzenes. California Research Corp. **786 668**

Separating and recovering acid gases from gaseous mixtures. Soc. Per Azioni Vetrocoke. **786 669**

Metallisable polyazo dyestuffs. Sandox, Ltd. **786 670**

Manufacture of doped germanium crystals. Franke, J. I. **786 671**

Treatment of regenerated cellulose products. Courtaulds, Ltd. **786 383**

Basic alkoxyalkyl esters of phenothiazine-10-carboxylic acid and process for preparing same. Ayerst, McKenna & Harrison, Ltd. **786 384**

Residuum conversion process. Esso Research & Engineering Co. **786 451**

Fluorescent compositions. Switzer Bros., Inc. [Addition to 733 856.] **786 678**

Organosilicon compounds. Midland Silicones, Ltd. **786 452**

Burners for burning liquid hydrocarbons. Naamlooze Vennootschap Philips' Gloeilampenfabrieken. **786 680**

Separation of gases occluded in liquids. Avery-Hardoll, Ltd. **786 591**

Polymerisation process. Polymer Corp., Ltd. **786 387**

Stable ketene dimer-emulsifier mixtures and their preparation. Hercules Powder Co. **786 543**

Organotin compounds. Associated Lead Manufacturers, Ltd., and Lewis, F. B. **786 545**

Titanium and zirconium organic compounds. National Lead Co. [Addition to 755 728.] **786 388**

Polymeric esters and products containing them. Du Pont De Nemours & Co., E. I. **786 592**

Stabilising levulinic acid during heating. Quaker Oats Co. **786 547**

Refractories and process of producing same. Norton Grinding Wheel Co., Ltd. **786 549**

Production of ferrites. Badische Anilin- & Soda-Fabrik AG. **786 477**

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